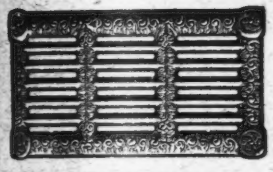
THE HEATING AND VENTILATING MAGAZINE

VOL. V., NO. 8 NEW YORK, AUGUST, 1908 $1.00 a year, 10 cents a copy

GURNEY HEATERS
FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER
THEY GIVE ENTIRE SATISFACTION SEND FOR CATALOGUE.
GURNEY HEATER MANUFACTURING CO.
NEW YORK OFFICE 12 E 42ND ST. 188-200 FRANKLIN ST. BOSTON.

KIELEY
Reducing Valves and Steam Traps for all services; Damper Regulators, Back Pressure and Relief Valves, Grease Extractors and Steam Separators, Pump Governors, Pump Regulators, Float Valves, Water Arches, Hot Water Temperature Controllers, Water Feeders, etc.
Kieley & Mueller
34 West 13th Street
New York City, N. Y.
Steam Specialties



FOWLER & WOLFE MANUFACTURING CO.
ORIGINATORS OF WALL RADIATION
Bourse Building, Philadelphia, Pa.
WE GUARANTEE OUR WALL RADIATION:
To contain the rated surfaces.
To have been tested at 100 lbs. pressure before shipment.
To provide for perfect circulation when installed in either vertical or horizontal form.
We challenge any other manufacturers of wall radiation to equal the above guarantee.

KINNEAR PRESSED RADIATORS
For STEAM and HOT WATER
LIGHT. COMPACT. DURABLE AND QUICK ACTING
Write for Catalogue and Literature
The Pressed Radiator Co. PITTSBURGH, PA.

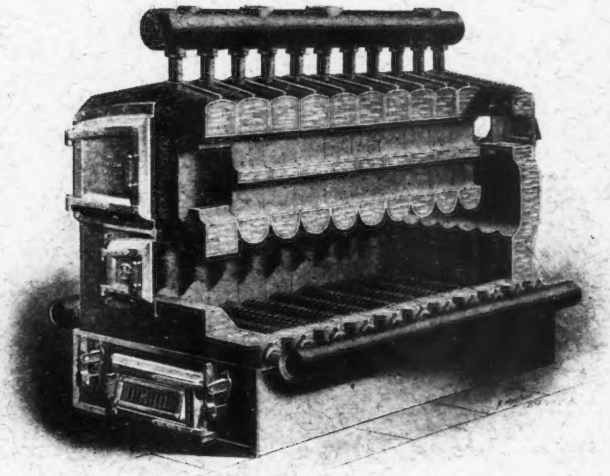
THE COVERING AND SUPPLY CO.
Manufacturers, Dealers and Contractors in
ASBESTOS MATERIALS
STEAM PIPE AND BOILER COVERINGS
OF EVERY DESCRIPTION
OFFICE and WAREROOMS
232 WEST ST., NEW YORK

STANDARD TEMPERATURE REGULATION CO.
WEST STREET BUILDING, WEST AND CEDAR STS., NEW YORK
AUTOMATIC HEAT REGULATION

Entered as second-class matter at the Post-Office in New York, N. Y.

Copyright, 1908, by A. S. Armagnac

BOILERS AND RADIATORS



MERCER BOILER.

STEAM AND WATER WARMING.

Grate 18, 27 and 36 inches wide.

Write for Catalog.

THE H. B. SMITH CO.

WESTFIELD, MASS.

SALESROOMS:

728 Arch St., Philadelphia. 39 East Houston St., New York.
138 Washington St. No., Boston.

PACIFIC COAST AGENTS

Holbrook, Merrill & Stetson, Los Angeles and Oakland, Cal.

EUROPEAN AGENTS

August Eggers, Bremen and New York.

Pipe, Fittings, Valves and Engineering Specialties

Automatic Air Valves

TRADE (S) MARK

Double Connection
Circulating
Syphon Action

A Guaranteed Valve

No. 1. Price, $1.15
Side Outlet, with Cap

No. 6. Price, $1.35
Side Outlet—Lock Shield

No. 3. Price, $1.15
Bottom Outlet, ⅛ or ¼ inch

These valves are the best made in every respect. Small holes and tubes are avoided, to prevent clogging. Being fitted with Double passages into the Radiator, all danger of throwing water and water clogging is eliminated. The Expansion post is made of an indestructible, highly sensitive compound, insuring quick action. The Workmanship is perfect, the Plating extra heavy and every valve tested and guaranteed for five years.

JOHN SIMMONS CO.

OFFICES AND SALESROOMS
110 Centre Street, New York

When writing mention Department E

MACHINE SHOP	FACTORIES AND SHOPS	DOCK
48 to 58 Baxter St., N. Y.	*155-161 Leonard St.,* *5-7 Franklin St., N. Y.*	*381 South St., N. Y.*

FOUNDRY AND PIPE BENDING SHOP
Newark, N. J.

TEMPERATURE AND HUMIDITY CONTROL

JOHNSON
SYSTEM
OF
TEMPERATURE
CONTROL

—

THE
"HUMIDOSTAT"
FOR
CONTROLLING
THE HUMIDITY
OF ROOMS

—

JOHNSON
REDUCING
VALVES
FOR STEAM
AIR, WATER
AND GAS

—

JOHNSON
PRESSURE
GOVERNORS
FOR PUMPS
BOILERS
AND TANKS

—

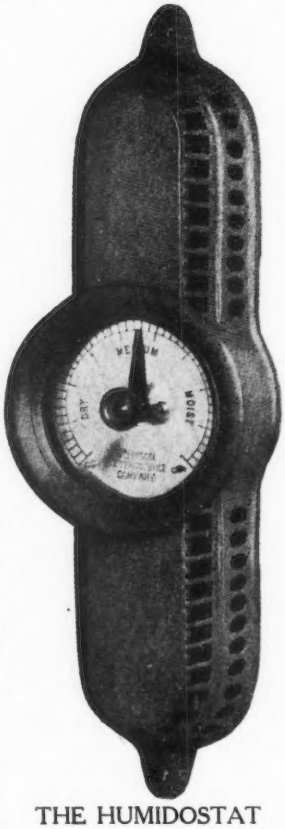
Send for
Catalogue H.

THE HUMIDOSTAT

WHAT IS IT?

The Humidostat is a device which regulates the air moisture in a room and holds it at any desired degree.

It is made of metal, neat in design and equipped with dial and index, which can be adjusted to the amount of Humidity desired. The Humidostat is connected by tubing with the heating apparatus. Its mechanism is so simple that it cannot get out of order, and yet it is so sensitive that it responds to the slightest variation from the desired degree of the moisture in the room.



THE HUMIDOSTAT

The Humidostat is in use in private residences and public buildings. Also in factories where the process of manufacture requires a fixed air moisture.

The Humidostat is the invention of Prof. Warren S. Johnson, of the Johnson Service Company.

JOHNSON SERVICE COMPANY

MAIN OFFICE AND FACTORY, MILWAUKEE, WIS.

NEW YORK, 36 East 20th Street
PHILADELPHIA, 1522 Sansom Street
PITTSBURG, 440 Sixth Avenue
DETROIT, 41-43 First Street
CHICAGO, 93 Lake Street
BOSTON, 60 Pearl Street
TORONTO, 136 Bay Street
DENVER, 311 Boston Building
INDIANAPOLIS, 22 East Ohio Street
BUFFALO, Erie County Bank Building
SAINT LOUIS, 205 North Tenth Street
MINNEAPOLIS, 203 Second Avenue South
SALT LAKE CITY, 212 S. N. Temple Street

The Chamberlin Leakage-Stop System

Enables Engineers and Architects to Reduce Initial Cost of Heating Systems

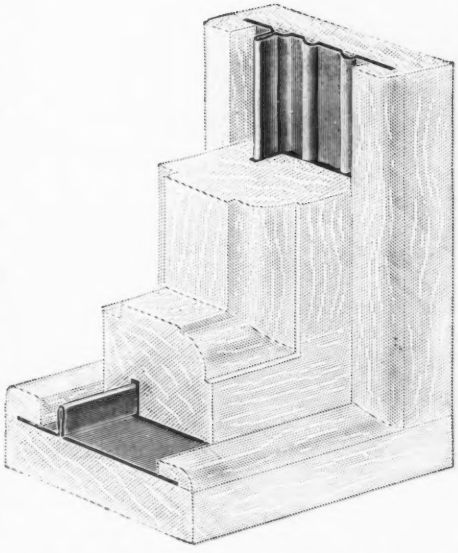
Guarantees to heat in zero weather made certain.

No loss of penalty bond.

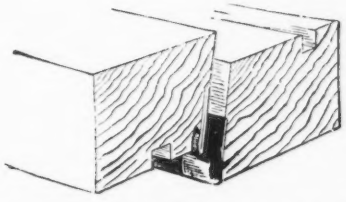
Endorsed by leading engineers.

Lasts as long as the sash.

Annual fuel consumption curtailed.



CHAMBERLIN "CORRUGATED" METAL WEATHER STRIP, SHOWN IN PLACE ON A WINDOW SASH



CHAMBERLIN WEATHER STRIP AS APPLIED TO MEETING RAIL OF WINDOW

BRANCHES:

NEW YORK
BOSTON
PHILADELPHIA
BALTIMORE
WASHINGTON
NEWARK
PITTSBURG
CLEVELAND
ST. LOUIS

LICENSEES:

CHICAGO
INDIANAPOLIS
BUFFALO
ROCHESTER
SYRACUSE
UTICA
ALBANY
HARTFORD
NEW HAVEN
PROVIDENCE
NEW BEDFORD
GRAND RAPIDS
WATERTOWN
WICHITA
KANSAS CITY
OMAHA
DES MOINES
DENVER
HELENA
SEATTLE
SAN FRANCISCO
MINNEAPOLIS
MILWAUKEE
CINCINNATI
DAYTON
FORT WORTH
OKLAHOMA
ST. JOSEPH
LOUISVILLE
MEMPHIS
ATLANTA
DAVENPORT
MANCHESTER
BIRMINGHAM

CONSULT OUR ENGINEERING DEPARTMENT

Chamberlin Metal Weather Strip Co.

HOME OFFICE & FACTORY - **DETROIT, MICH.**

SIMONDS AUTOMATIC VACUUM VALVES ARE SOLD OUTRIGHT WITHOUT ANY ROYALTY CHARGE

The Simonds is the only practical vacuum valve on the market and has the following advantages over others:—

Is **perfectly balanced** and will operate under **varying pressures** or **degrees** of **vacuum.**

As a result of this construction it has a very **large** and **free discharge opening,** being ½ in. in our smallest valve.

Will **not blow steam through** into the discharge and so cause waste.

On account of large discharge, is **free from fouling** with foreign matter.

Valves are **tight on their seats,** between the intermittent water discharges.

Is **sensitive** in operation, discharging from **one-half ounce** of water to a solid **one-half inch column,** according to demands on it.

Is **vented when cold,** so that air is expelled from radiation before water reaches the valve.

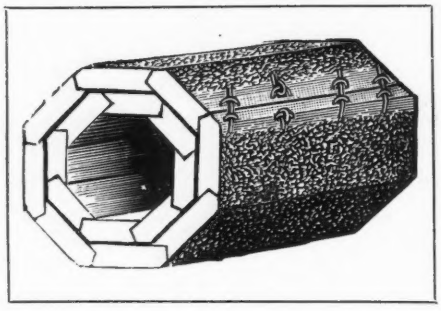
Relieves the system of **all water** and **air without any waste.**

Guaranteed **satisfactory** and will **protect users** from loss by reason of infringement suits.

If interested, send for booklet on Automatic Vacuum Valve

SIMONDS HEATING AND SPECIALTY CO.
106 WASHINGTON AVE., DETROIT, MICH.

Steam Economy Talks—2



¶ Where steam pipes are in place and cannot be disconnected we furnish the Wyckoff Patent Steam Pipe Covering as shown in the accompanying cut, illustrating the manner of preparing the covering for cutting lengthwise. Remove the asphaltum coating and staple the wire on each side of the joint, as shown in cut. File or cut the wire between the staples. This will allow the outside covering to be opened. Then cut the paper on the inside shell, staple and cut wire same as outside. If this covering is to be cut in halves, remove coating, staple and cut wires at the opposite joint in the same manner.

Tests made by Prof. R. C. Carpenter of Cornell University show that the transmission of sufficient steam to produce 100 horse power for a distance of 1000 feet in naked steam pipes exposed to still air resulted in a loss through radiation and condensation of 37.6 per cent.

The same pipe covered with wood and solid earth lost 11.2 per cent.

The same pipe enclosed in Wyckoff's Patent Steam Pipe Covering lost *only 4.2 per cent.*

Catalogue F will give you every particular
May we send you a copy?

A. Wyckoff & Son Co.
ELMIRA, N. Y.

The Heating and Ventilating Magazine

VOL. V No. 8

Contents for August, 1908

Twelfth Semi-Annual Meeting, American Society of Heating and Ventilating Engineers - - - - - 1
Report of Proceedings

Reasons Why the Science of Heating and Ventilation Should Be Observed - - *Prof. J. D. Hoffman* 6

A Hot Air Furnace in a House Without a Cellar *R. S. Thompson* 10

Air Cooling - - - - - *Theodore Weinshank* 17

Coefficient of Transmission in Cast-Iron Radiation *Prof. John R. Allen* 20

Identification of Power House Piping by Colors *William H. Bryan* 28

A Remarkable New Steam Radiator Valve - - - 30

The Weather for July - - - - - - - - 32
New York, Boston, Chicago, Pittsburg and St. Louis

Trade and Miscellaneous Notes - - - - - ix

YEARLY SUBSCRIPTION, $1.00 **SINGLE COPIES, 10 CENTS**

Published monthly by the Heating and Ventilating Magazine Co., 1123 Broadway, New York.

THE "PEERLESS" AIR WASHER

MADE OF COPPER ═══ ═══ IS EVERLASTING

THE SPRAYS CANNOT CHOKE UP

THE BEST SPRAY HEAD MADE

Adopted by Us After Others Were Given A Thorough Test and Found Wanting

Found to be the only device which would make a fine spray to properly clean the air and at the same time form a very fine mist, saturating and humidifying the air without automatic devices of any kind.

OUR WASHERS require no attention

Adapted for
Schools
Banks
Office Buildings
Stores
Hotels
Laundries
Etc.

SPRAY HEAD FOR THE PEERLESS AIR WASHER

Especially good for furnishing good, clean, pure air for Hospitals, giving just the proper humidity for sick people.

Send us your plans or preliminary sketches and we will prepare detailed plans and specifications covering, not only the **AIR WASHER,** but the entire heating and ventilating equipment.

WRITE FOR NEW CATALOGUE

The New York Blower Co.

Main Office, CHICAGO, ILL., Works, BUCYRUS, OHIO

639 Bourse Building, PHILADELPHIA, PA. 253 Broadway, NEW YORK, N. Y.
611 Victoria Building, ST. LOUIS, MO.

SEE SWEET'S INDEX

THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK AUGUST, 1908

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Twelfth Semi-Annual Meeting, Niagara Falls, July 24-25, 1908

Within earshot of the roar of Niagara, and under ideal weather conditions, President James Mackay called to order the mid-summer meeting of The American Society of Heating and Ventilating Engineers in the convention hall of the International-Cataract Hotel, Niagara Falls, Friday morning, July 24. A representative attendance of heating engineers was disclosed by the reading of the roll-call, and as the proceedings advanced, many additional names were added to the list of those present.

The programme proved one of full and varied interest, as was evidenced by the extended discussions on the subjects presented.

The following signed the society's register at the meeting:

THOSE PRESENT

James Mackay, Chicago.
J. D. Hoffman, Lafayettte, Ind.
W. M. Mackay, New York.
C. G. Scollay, Brooklyn, N. Y.
Frank K. Chew, New York.
John F. Hale, Chicago.
Harry S. Martin, Dunkirk, N. Y.
S. F. McDonnell, Cleveland, O.
Jas. H. Davis, Chicago.
Joseph Graham, New York.
J. P. Dugger, Chicago.
C. E. Oldacre Toronto.
F. E. Ellis, Toronto.
J. A. Donnelly, New York.
W. H. Johnson, Indianapolis.
C. B. Kennedy, Pittsburg.
Geo. D. Hoffman, Chicago.
Joseph A. Gorton, New York.
Ray D. Lillibridge, New York.
H. W. Whitten, New York.
H. Howard Armstrong, Pittsburg.
A. S. Armagnac, New York.
J. F. Siegel, Chicago.
S. C. Smith, Scranton, Pa.
W. E. Henshaw, Buffalo.
Arthur Ritter, New York.
John B. Morgan, Schnectady.
Edwin C. Evans, Syracuse.
E. E. Joralemon, Niagara Falls.
A. O. Jones, Battle Creek, Mich.
H. L. Mosher, Dowagiac, Mich.
W. R. Stockwell, Irvington, N. Y.
H. S. Welsh, Rochester, N. Y.
David Miller, Toronto, Canada.
Weston Wrigley, Toronto, Can.
H. E. Kenney, Detroit, Mich.
John B. Ruckel, Buffalo, N. Y.
H. J. Schoman, Buffalo, N. Y.
Howard T. Gates, New York.
F. F. MacNichol, Oshkosh, Wis.
W. Dewhurst, Birker, N. Y.
F. T. Sedge, Birker, N. Y.
Jno. K. Allen, Chicago.
W. W. Macon, Brooklyn.
Charles R. Bishop, Lockport, N. Y.
Sam Kauffman, St. Louis, Mo.
F. S. Whitelaw, Buffalo, N. Y.
C. B. Thompson, Buffalo, N. Y.
Eugene Bradley, St. Louis.
E. F. Capron, Chicago.
R. M. Stackhouse, Chicago.
A. H. Hunter, Buffalo, N. Y.
C. H. Cornes, Lockport, N. Y.
Wm. Braemer, Camden, N. J.
E. N. Squires, Buffalo, N. Y.
Theo. Weinshank, Indianapolis.
Daniel Stern, Chicago.
L. A. Chevey, Buffalo.

MEMBERS AND GUESTS OF THE AMERICAN SOCIE
ANNUAL MEETING, NE

Chas. N. Fortune, Galt, Ontario.
J. Barnum, New York.
T. B. Cryer, Newark, N. J.
J. J. Blackmore, New York.
E. S. Berry, Philadelphia.
Louis K. Berman, New York.
W. G. LeCompte, New York.
William T. Johnson, Buffalo.

Following the reading of the roll by Secretary W. M. Mackay, the President read his address, in which he extended a hearty welcome to all present and announced that the privileges of the floor would be extended to members and guests alike.

The next item on the programme was a report from the Illinois Chapter. This report was read by John F. Hale, secretary of that chapter, who stated that the Illinois Chapter was in a flourishing condition, and that the monthly meetings it had held, were well attended and had brought out discussions on many important subjects, as reported in the trade press.

The reports of committees was then called for and an interesting discussion was had as to the method of procedure to be followed by special committees, there being at present no less than eight at work on various matters within the scope of the society's activities. It was ruled that the reports of the special committees, when made, should be presented direct to the society and then turned over to the proper standing committees, rather than the other way about.

VENTILATION OF FACTORY BUILDINGS IN NEW YORK STATE

At this point a communication was read from Clayton W. Old, calling attention to a most important factory ventilation law recently enacted in New York State. Following is Mr. Old's letter:

Mr. James Mackay, President American Society of Heating and Ventilating Engineers:

I desire to bring to your attention a matter which it seems to me vitally concerns the aims and sphere of work of your society. You have, I am aware, for years been trying to get through at Albany proper legislation insuring better ventilation in the buildings of New York State and city. Doubtless, largely as a result of your work in this line, there was last year embodied in the law relating to labor and factories a clause (section 66) making it compulsory upon all owners, agents or lessees of what are commonly known as lofts, i. e., buildings occupied by a considerable number of persons engaged in such work as the manufacture of clothing, cigars, etc., to provide and maintain proper ventilation therein.

This law was placed on the books during 1907 and went into effect October 1st last. The enforcement of the law comes under the charge of the bureau of labor, the chief inspector of which is Mr. W. W. Walling, who, fortunately, is an engineer and thus capable of deciding the many and varied problems which are brought before him in his work, and even more fortunately, is very determined that the law, as it stands, shall be fully and impartially enforced as rapidly as possible.

He has at present many deputies at work in New York City examining the

TING AND VENTILATING ENGINEERS AT THE SEMI-
LS, JULY 24–25, 1908

conditions of the atmosphere in sweat shops and like buildings, and as fast as those cases calling for reform are brought to his attention is issuing orders for the immediate improvement of conditions.

I speak unofficially and without permission in saying that I have been informed by him that lofts are frequently inspected where the percentage of impurity runs as high as 42 parts of CO_2 in 10,000, which, of course, is absolutely dangerous to health and life. Frequently, as many as 250 occupants are employed in one room without the artificial introduction of 1 cu. ft. of fresh air a week. It is needless to assure you that unspeakable results follow, calling loudly for just such insistence upon better conditions as the State is now making, backed up by this good law.

The expense involved to the owners of these loft buildings is, of course, frequently very considerable and protests by the hundreds are being made against the enforcement of the law by those interested more in their rentals than in better conditions for the occupants of their buildings.

Of late this opposition has taken the form of an organized league known as the Realty League, the object and intention of which is to stop the enforcement of the law by injunction and, later, to have it repealed or made harmless to them by amendment.

I am more or less familiar with the working of this organization and assure you that they will stop short of nothing but the above result.

Among those forming part of the organization are the agents of many large estates controlling in all possibly the larger portion of the loft buildings in New York. Some of these estates own as many as twenty large loft buildings.

Believing it probable that without organized resistance to their work the results of your labors of years past are in great danger of being nullified, I take the liberty of suggesting that at its annual convention, your society, by resolution, declare themselves in accord with the present law, and that a competent and energetic committee be appointed to enlist the support of the present legislative body in Albany in an organized opposition to the repeal or amendment of this law. This committee will find upon investigation that almost every member of the Senate has already been approached and his support solicited by the other party. Their work is quietly but thoroughly going on in this way and there is little doubt of the outcome unless equally good work is done by your committee and its deputies.

I would suggest further that a resolution be passed commending Chief Inspector W. W. Walling for his impartial and intelligent enforcement of the law as it stands on the books to-day.

With assurance of my esteem, I remain,

Yours very truly,

CLAYTON W. OLD.

Manager Atlantic District, American Blower Company.

Attached to Mr. Old's letter was a circular which is being sent out by Chief Inspector Walling to factory inspectors calling attention to the law. Following is a copy of the circular in full.

Suggestions to Deputy Factory Inspectors on Ventilation.

BY CHIEF FACTORY INSPECTOR W. W. WALLING.

Ventilation, as commonly understood, means the removal of foul and the in-

troduction of fresh air, and in many cases it includes the idea of a thorough mixing of pure with impure air, in order that the latter may be diluted to a certain standard. According to Dr. John S. Billings, perfect ventilation means that any and every person in a room takes into his lungs at each respiration, air of the same composition as that surrounding the building, no part of which has recently been in his own lungs or those of his neighbors, or which consists of the products of combustion generated in the building, while at the same time he feels no currents or drafts of air, and is perfectly comfortable as regards temperature, being neither too hot nor too cold.

Air is a mixture of gases and vapors, two of which, oxygen and nitrogen, constitute the greater part, and are found in almost constant proportions. From a hygienic standpoint, nitrogen possesses but little interest, while without oxygen, fires and lights would not burn, food would not digest, the blood remain unpurified and life would soon cease. Air also contains various other gases and watery vapors, while from 3 to 4 parts in 10,000 of carbonic acid gas is generally present. The chemical composition of 100 parts of free atmosphere is herewith contrasted with the same number of parts of expired air:

Free atmosphere		Expired air
0.03¾	Carb. Ac.	4.3¾
79.2	Nitrogen	79.2
20.8	Oxygen	15.4

It is therefore patent that expired air contains 5% less oxygen and a little over 4% more of carbonic acid gas than that which is inhaled. Carbon dioxide, better known as carbonic acid gas, is commonly considered the poisonous gas in the atmosphere, but this is hardly true, as large quantities can be breathed with impunity when pure and mixed with air. It will not support life, and by shutting out the required amount of oxygen, it produces asphyxia.

We need ventilation because we have to breathe, because every breath uses up and spoils a certain amount of air. A person will drown in one or two minutes, because air is kept out of the lungs. Sleeping in a room wherein an open charcoal fire is burning produces the same results as drowning, and has been frequently used by those with suicidal bent.

In this connection is always cited the famous instance of the Black Hole of Calcutta. This was a room about 18 ft. square and during the Sepoy Mutiny of 1857 146 Europeans were incarcerated for a night. Although the room had two small windows, 126 men died during the night, while the survivors lived but a short time.

Another case is that of the Steamer "Londonderry," which was overtaken by a storm in the Irish Sea. The 200 passengers were ordered below and the hatches battened, when before their suffering could induce the captain to set them at liberty 72 had died of suffocation. While these are extreme cases, causing almost instant death, impure air produces slow poisoning, and is too frequently the direct cause of consumption and its accompanying diseases, bronchitis, catarrh and pneumonia, while diphtheria, measles and various fevers are promoted by it.

The immediate effect of breathing impure air, one experienced by each of us, is a feeling of stupor, inactivity, drowsiness, languor and sometimes headache, vertigo and nausea. Little dependence can be placed on the sense of smell as an agent in detecting foul air, as no other organ is more easily deadened by excessive action than the nose. The oppressive, sickening, oft-times nauseating odor that greets one upon entering an illy-ventilated room is scarcely noticed after a few minutes. Not until the return to the pure air is the foul atmosphere a subject of thought.

It has been aptly said that "He who lives in a garden cannot smell a rose, while the wood cutter in the southern forests is insensible to the odor of the magnolia." Stepping into a closed bedroom where a person has slept all night, the smell is often intolerable, while the person who occupied it detects nothing unusual. The peculiar odor common to churches, noticeable upon entry, is forgotten by the time one reaches his pew.

It is therefore obvious that the sense of smell is not sufficient to warn us of danger in atmospheric conditions and that other means have to be adopted. The safest and most practicable method is that of measuring the carbon dioxide. While not of itself particularly dangerous, carbon dioxide is usually found in very bad company, and its presence indicates with much certainty the presence of those really offensive and dangerous gases and impurities which are a menace to life and health.

In large factory buildings heating and ventilating are almost inseparably connected, still there is scarcely a factory in New York wherein any provision is made for proper ventilation. In order to heat a building with the greatest economy, windows and doors are made as tight and close fitting as possible consistent with opening, and in many cases the only pure air entering a building is that which finds its way around windows and doors.

An old writer said "When men lived in houses of reeds, they had constitutions of oak; when they live in houses

of oak, they have constitutions of reeds."

Since ventilation is obtained by bringing in a constant supply of fresh air and forcing out impure and vitiated air, it is evident that open windows in many instances will provide more or less adequate and satisfactory ventilation. Window ventilation is, however, limited, since the introduction of a large volume of cold air causes drafts, and those engaged in sedentary occupations can not work in a draft.

Simple arrangements can be made whereby the incoming air at the bottom of the window is deflected upward, while proper openings at the top will allow for the removal of the vitiated air, and in many factories, if there are sufficient heating facilities, this method may suffice. Other factories will require the removal of foul air by aspirating flues, wherein the air is moved by natural or mechanical means. Whenever the introduction of sufficient air reduces the temperature of the room to an uncomfortable degree, it is obvious that the ventilation and heating systems must be combined.

I believe we are justified in demanding a system that will furnish, in ordinary trades, a minimum of 2,000 cu. ft. of fresh air per hour for each person, and the removal of the same amount, which supply under no circumstances should fall below 1,500 cu. ft. per hour.

As a ventilating system, properly installed, is a part of the factory building, it should be and, by the amended provisions of section 94 of our law, must be provided by the owner, agent or lessee of the property and in a tenant factory the duty of maintenance and repair is that of the tenant or occupant. While there is some variance of opinion as to the best method to provide suitable ventilation, we will leave owners free to ventilate by such methods as they may see fit to employ, insisting however on the amount of air as stated above.

Noxious gases, excessive heat and dust should be removed by the use of hoods and pipes placed over the machines or the places where generated. The amount of air required to ventilate a room wherein a noxious gas is generated would be much less if a hood were used than if the gas were allowed to permeate all parts of the workroom. This applies to excessive heat conditions also. It is not expected or even necessary that inspectors should be experts on this great subject of ventilation; the details properly belong to the heating and ventilating engineer. To be able to explain the necessity for ventilation, what the department will insist on, and to determine whether a system is satisfactory will be quite enough for present needs.

New Factory Ventilation Law for New York State.

Following is the text of the factory ventilation law referred to by Mr. Old in his letter, which was adopted in its present form last October. The law appears under "Article VI. Factories," and is numbered Section 86:

The owner, agent or lessee of a factory shall provide, in each workroom thereof, proper and sufficient means of ventilation; and shall maintain proper and sufficient ventilation; if excessive heat be created or if steam, gases, vapors, dust or other impurities that may be injurious to health be generated in the course of the manufacturing process carried on therein the room must be ventilated in such a manner as to render them harmless, so far as is practicable; in case of failure the commissioner of labor shall order such ventilation to be provided.

Such owner, agent or lessee shall provide such ventilation within twenty days after the service upon him of such order, and in case of failure, shall forfeit to the people of the state, ten dollars for each day after the expiration of such twenty days, to be recovered by the commissioner of labor. [As amended by L. 1907, ch. 400, in force Oct. 1.]

The existence of such a ventilation law in New York State proved a surprise to most of the members and the importance of backing up Chief Inspector Walling in his enforcement of the law was unanimously concurred in.

A resolution placing the society on record as highly approving the course of Chief Inspector Walling was passed, and in addition it was voted to add to the Committee on Compulsory Legislation the names of several New York State members whose duty it would be to render the society aid in enforcing the law and especially in combating any efforts looking towards its repeal.

The first paper on the programme was then read by Prof. J. D. Hoffman, entitled "Reasons Why the Science of Heating and Ventilation Should Be Observed." Prof. Hoffman's paper was as follows:

Reasons Why the Science of Heating and Ventilating Engineering Should be Observed*

By Prof. J. D. Hoffman

The science, if such it may be called, of heating and ventilating engineering, is one that is founded almost completely upon the laws of thermodynamics. It is not what one might call an exact science, but, in its rational design and application, the engineer may work with a reasonable degree of exactness. Most of the points of interest in the subject may be theoretically developed, yet, as in all branches of engineering design, some parts require theory modified by good judgment and the personal equation of the designer.

In such cases empirical data, found by tests upon similar apparatus, are not only good things to apply as checks, but at times are absolutely necessary because of the lack of any rational information on that part of the subject. Fortunately, such cases are the exception rather than the rule, for with the properly applied principles of thermodynamics there is scarcely any part of the subject which is not possible of rational solution.

Because of the fact, however, that some features of the work are as yet empirical and not as definitely understood as they should be, this is no reason why those who install heating and ventilating apparatus should disregard all laws and feel justified in installing a job that is empirical in all its parts, and one which shows scarcely any of the earmarks of theoretical investigation. The time has surely come when it may be demanded of all men who install such apparatus that they follow closely to fundamental principles and be prepared to furnish proof for any step taken in their work.

LETTING OF CONTRACTS.

Contracts for heating and ventilating apparatus usually are let in one of the four following ways:

(a) Some person, called for convenience the dealer contractor, draws up a rough layout of the work, guarantees to install satisfactory apparatus for a stated amount of money, buys his apparatus from the manufacturer, installs it according to his own personal ideas, or according to the plans laid down by the manufacturers, and in a general way guarantees it to give good service.

(b) A manufacturing firm draws up a plan and contracts to install, for a stated amount of money, satisfactory apparatus, usually made by the same company, guaranteeing its successful operation.

(c) A responsible engineer is retained, who draws up plans and specifications for the work, and, upon competitive bids, the successful contractor installs the apparatus in accordance with these plans and specifications, the engineer being the judge of the quality of the work and materials.

(d) A responsible engineer designs the system and assumes all the responsibility in its erection, looking toward a certain required output or result. Materials are purchased in the open market and installed to his satisfaction, and after completion, if the final tests are acceptable, the purchaser pays the bills and takes charge of the completed plant.

The last method is not much used in heating and ventilating installation as yet, being confined largely to power and manufacturing plants where a certain definite output of finished material is desired, and will not be further discussed; methods (a) and (b) being applicable to small installations and (c) to larger and more important ones.

RESIDENCE HEATING BY FURNACES.

Of all the uncertain and rule-of-thumb installations, probably the furnace heating of residences can claim the greatest share. Competition among the furnace manufacturers has been so great that we have the coun-

*Paper read at the Summer Meeting of the American Society of Heating and Ventilating Engineers, Niagara Falls, N. Y., July 25, 1908.

try flooded with furnaces ranging in quality from good to positively bad. In order to place the furnaces, it has been the desire, and this is a legitimate one, to simplify construction, to remove features not absolutely necessary, to cheapen manufacture, and in many cases to so rate the furnace that the claims could be realized only under the best conditions of installation, such as would be expected under test conditions and not under conditions as found in average service. Of the above mentioned points, the last one should not obtain in any case, since a furnace should be so rated as to realize its claims even under somewhat unfavorable conditions and the other points should hold good only in so far as not to develop an inferior type of furnace.

In addition to what has been said about the furnace, it is also true that the furnace manufacturer has been so busy cheapening his product and placing orders that he has been selling to Smith, Jones and Brown to install according to their own notions of engineering work, and has not had time to investigate the engineering reputation of Smith, Jones and Brown to see if they would probably bring credit to his firm, nor has he had time to keep his own finger upon the pulse of the job to see if the plant is working well after it is installed.

This apparent indifference of the manufacturer to the final results is probably the greatest source of trouble, and is that which gives color to the public mind and decides the buyer against furnace heat, because, as he has some right to argue, "Furnace plants are usually installed so as to make them inferior and defective, consequently the system is in itself defective."

It is fast becoming a fact that the correct furnace job is the exception rather than the rule, and some remedy should be applied very soon. The fault is not in the system. Furnace heating, if properly installed, is healthful, cheap and scientific. Neither can it be said that the fault all rests with the manufacturer. The purchaser is to a certain degree to blame, in that he is willing to let the contract go to any one who cuts to the lowest price regardless of the quality of the man who takes the contract or of the apparatus which he represents.

In certain localities it has become almost impossible for a man of reputation and integrity to obtain a contract, because he expects to live up to the "full intent and meaning" of the contract, and proposes to stay with his work until it is fully satisfactory, regardless of cost. Such a man usually presents an estimate that is sometimes considered high when compared to some others, but when the expense of changes and repairs is taken into account it would in many cases be the cheaper proposition.

It does seem unfortunate that there are men in the business who are in it exclusively for the dollars, and care little as to the results. If such men were held strictly to the satisfactory fulfillment of the contract, even though it were to the substitution of an entirely new system, there would be less careless and haphazard bidding, and part of the troubles at least would be remedied.

Another phase of the heating business which is a frequent source of annoyance and error is the relation of the heating engineer or the contractor installing such work to the architect. The house plans are usually made without the consideration of heating; the heating plans are then supposed to be made to fit the house plans.

Now what the average architect does not know about the heating business would fill many books, but his own private opinion of his own worth in such matters is highly satisfactory, and consequently there is set up a different viewpoint between the designer of the building and the designer of the heating apparatus, much to the discomfort of the latter and to the detriment of his work in many cases.

To be just to both, the system of heat should be selected first and then allowances should be made in the building plans for its installation. This is no hardship to the architect,

since many slight changes, any one of which would possibly be in favor of the heating engineer, may be made in his plans without causing any trouble.

Some of these points may be mentioned as follows: The size and location of the chimney; the running of the cellar partition walls to accommodate the location of the furnace and the coal bin; the height of the basement ceiling to allow sufficient inclination of the leader pipes; the construction of the partition walls between the rooms to allow for riser pipes of sufficient size to heat large upstair rooms; the planning of the walls to avoid horizontal runs of heat ducts in the second floor to reach a room otherwise inaccessible; and other points not necessary to mention.

All heating engineers know that the range of location of a furnace relative to the house plan is very limited, and that in many cases it is an absolute necessity, after the house plan is completed, to set the furnace out of this desired location, thus compromising the efficiency of the system; also, that the basement ceiling in many cases is so low that the leaders require to be run nearly horizontal, thus reducing the draft in them; also, that a 6-in. studded wall in many cases could easily have been substituted for the 4-in., with little additional cost, and have improved the system immensely; also, that certain walls absolutely prohibit the running of stacks to the desired spot in the room, and that, with a slight change, this could have been arranged without in any way injuring the architect's plans. Such in brief are some of the troubles that the conscientious heating engineer or contractor faces when he proposes to do his work after the building plans have received the O. K. of the architect.

Finally, however, the purchaser himself occasionally offers objections to the proper design of the system because of the desire to economize, although false economy it may prove to be in the end. Occasionally one hears the advice, "Don't heat the chamber rooms on the second floor very warm, because I like a cold sleeping room." Advice which, if heeded, would be good nine times in ten, but the tenth time when it is needed, it is needed badly, and the system and the man who installed it are both censured. How much better to have made the job right at first and permit the owner to regulate the damper to suit his needs, even to closing it entirely.

The only word that could be spoken against this way of doing things is because of the very small increase in first cost; on the other hand, the favorable comment would be: "A system that is correct and one that will heat if you want it to." Good advice to all men installing residence heating systems is, "Heat every room as though it were to be used as a living room, and let the owner regulate to suit his needs."

RESIDENCE HEATING BY HOT WATER AND STEAM.

Not so much can be said about the failures in hot water and steam systems, because, as a rule, they are planned with greater care and by men better qualified to do the work. However, of all the difficulties experienced in both systems, by far the greater part can be charged to the hot water work. This is to be expected, when one remembers how very small is the motive force causing circulation in the water and how easily this may be counteracted by small pipes, many short turns or improper laying.

Short cut rules for proportioning radiation are, also, in too frequent use even by those well grounded in the subject, and from whom could be demanded a more rational course.

Residence heating by hot water and steam is fairly well standardized, and if designed from fundamental laws and principles, and installed with care and good judgment, should in every case give good results.

Some of the points wherein these systems give trouble are as follows: Chimneys too small; heater or boiler too small; heater or boiler too far from chimney; heater or boiler set

too high, thus giving too little pitch to the main piping; mains too small, thus killing the flow of the water and steam, also bringing the water line of the boiler too near the level of the lowest radiation; radiation too small and improperly placed; and other minor points.

The architect is responsible for the location and capacity of the chimney, and, in a degree, to the location of the heater or boiler, for, as he plans the basement, the heating apparatus must be located to suit. Many chimneys are poorly located and are of improper size, and when the heater or boiler does not fire well the responsibility of the architect in the matter is seldom thought of, and the censure is placed upon the shoulders of the man who installed the heating apparatus.

This feature of the work is where the heating engineer can do some missionary work in the line of architectural design. The other points mentioned are directly chargeable to the man who designs the heating system, and there is little excuse for his mistakes.

All should know that the surface of mains and branches should be counted as radiation surface, and that the efficiency of the heater or boiler is somewhat reduced after having been in service for a time. Because of this latter point, a selection would be made having a capacity about 25% greater than the total radiation found. When such a generator is properly set, all pipes in the system will have a satisfactory fall, the minimum height of circuit will be sufficient to cause a good circulation, and the pipes will be so proportioned as to avoid short circuiting or water hammer.

Too small mains on a steam system have a tendency to force the water on the return end back into the radiators and cause "flooding." All of the above points, and still others that might be named, will stand as a credit or discredit to the designer.

THE HEATING ENGINEER AND THE CONTRACTOR.

In installations calling for a large expenditure of money, the heating engineer is usually called in to draw up the plans and specifications, and the contract for purchasing and installing the same is usually given to a separate party. This has the advantage of obtaining the complete layout of the plant with the apparatus specified by a party who is in a position to give an unbiased opinion, and also the advantage of obtaining a low estimate on installation because of the competitive bids.

This system seems to be a very satisfactory one, all things considered, and probably gives the best results to the purchaser. It is not, however, entirely free from abuses. It is assumed that the party retained to do the engineering work will do his work conscientiously and scientifically, and that when done each part will correlate to the other parts and all will work in harmony and without loss of efficiency. This means that the designer himself should understand his subject and should be able at any time to give facts and figures on every part of the work. He should also have his plans and specifications complete in all parts and stated in plain and definite language, so that the contractor will understand every part and not be compelled to assume conditions which in the end may be erroneous. No uncertainty should enter into any part of the contractor's work, either as to quality and make of materials, or as to the way in which such materials are to be installed.

Of course, there are many features of the work which may be left open to the discretion of the contractor, and these should not be arbitrarily stated. Such parts as the smaller details of the piping system, for example, where the cutting of the various parts may not in the least affect the efficiency of the plant, and where purposely omitting the same in the specifications and plans will give some latitude and satisfaction to the contractor in his work. These and other minor points are best not specified.

The great trouble, however, with plans and specifications is not as to their exactness even to every little unnecessary detail, but as to the lack of

exactness concerning important points. When the contractor may reasonably make more than one interpretation of any certain part, it is naturally to his interest to take such view of the case as will carry out the letter of the contract at the least possible expense. This may not be to the best interest of the purchaser, but such procedure should not be wholly charged to the contractor.

The final word of caution that this paper wishes to extend probably does not apply to any member of this organization, but it does apply in many cases to men in like occupations with yourself. The keynote is struck in the preceding paragraph and may be paraphrased in the following: "The engineer attacking any important problem should first become thoroughly familiar with the principles involved in its solution, and should afterwards check his results wherever possible."

This point was emphasized to the writer in a test recently run upon a heating and ventilating plant in a certain building used for auditorium purposes. The trouble in this plant seemed to be not the one usually found—i. e., cutting of parts to a minimum size and capacity—but rather the reverse will be seen by only one item out of a number which might be used for the benefit of illustration. The auditorium, which was exposed on two sides, contained 225,692 cu. ft. of volume, and was designed to accommodate 1,350 persons, thus requiring, we will say, a total of 2,430,00 cu. ft. of fresh air per hour. Allowing the outside temperature to be zero and the temperature of the auditorium air to be 65° F., the total heat loss, including that thrown away with the air, was found to be by calculation 3,072,875 B. T. U. per hour, which gave by calculation 2,375 sq. ft., or 7,125 lineal ft. of 1-in. coil surface in the indirect heater. When the coil surface was measured after the test, it was found to contain 14,612 lineal ft., or a little more than twice the calculated amount. One reason for the test was the fact that a large part of the coil surface had been shut off soon after installation and never used afterward, and it was supposed that the system was not well proportioned. Other parts of the plant also seem to show the same lack of rational design.

What has just been stated concerning this one plant is true of too many plants about the country. If the business we represent is to rank high among other lines of engineering work, it is the duty of every man to discourage such methods and insist upon a higher standard.

(*A full report of the discussion of this paper will be published in* THE HEATING AND VENTILATING MAGAZINE *for September.*)

The next paper was entitled, "A Hot Air Furnace in a House Without a Cellar," by R. S. Thompson. This paper was read by Frank K. Chew in the absence of Mr. Thompson and is printed herewith.

A Hot Air Furnace in a House Without a Cellar*

BY R. S. THOMPSON

Some time since I was asked if I could put a furnace in a house where there was no cellar, and where, on account of local conditions, a cellar was impossible.

I replied that it could be done, and I submit herewith a sketch showing how it was done.

The house had six rooms, four in first story and two in second, the rear being only one story high. As the two halves of the house were much alike, a sectional view of one side

*Paper read at the Summer Meeting of the American Society of Heating and Ventilating Engineers, Niagara Falls, N. Y., July 24-25, 1908.

shows practically the whole. The dimensions of the rooms are given on the plans.

I had the owner build a small shed room in the rear, so that it extended across both the back rooms, or rather part of each room, as shown in the first floor plan. In this the furnace was set opposite the central partition, so that one-half the furnace was back of each room.

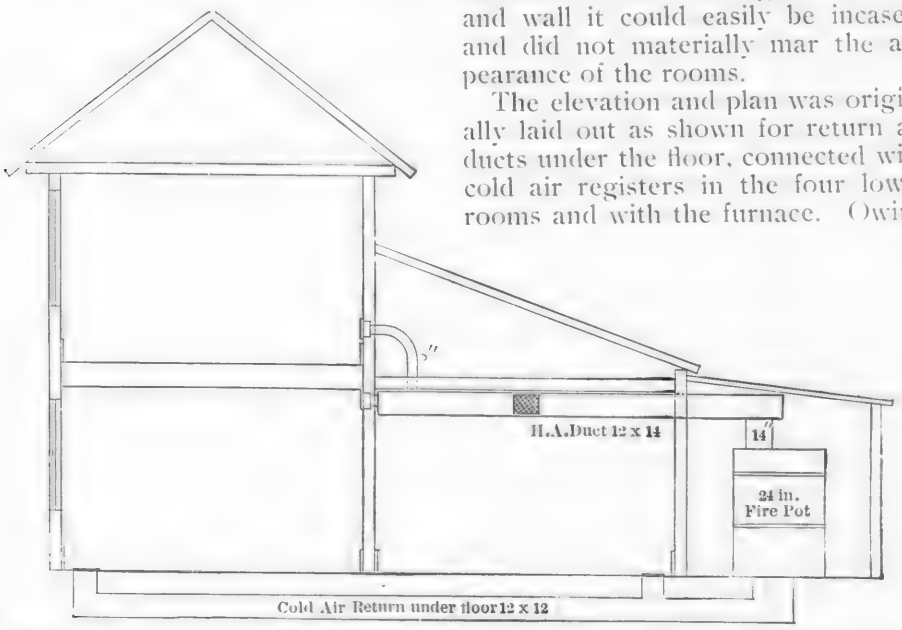
A rectangular pipe 12 in. x 14 in., made of galvanized iron, was placed under the ceiling of the rear room, against the inside wall, and carried through the wall into the furnace room over furnace, with which it was connected by a 14-in. upright round pipe.

A register in the side of this rectangular pipe, as shown in the elevation, heated the room through which it passed. Close to the ceiling in the front rooms wall registers were connected with the end of the rectangular pipe. An 8-in. round pipe was tapped into the top of the rectangular pipe near the front of the room, carried through the loft and into a register in wall of front upper room above baseboard, as shown.

The two lower and the upper room on the other end of the house were handled in practically the same manner. There were thus two 14-in. pipes taken off top of furnace to heat these six rooms, the two having an aggregate area but little greater than that of six 8-in. pipes. But I have found that one 14-in. pipe will carry more air than three 9-in. pipes, and a pipe rising perpendicularly off the top of a furnace will carry much more air than a horizontal one.

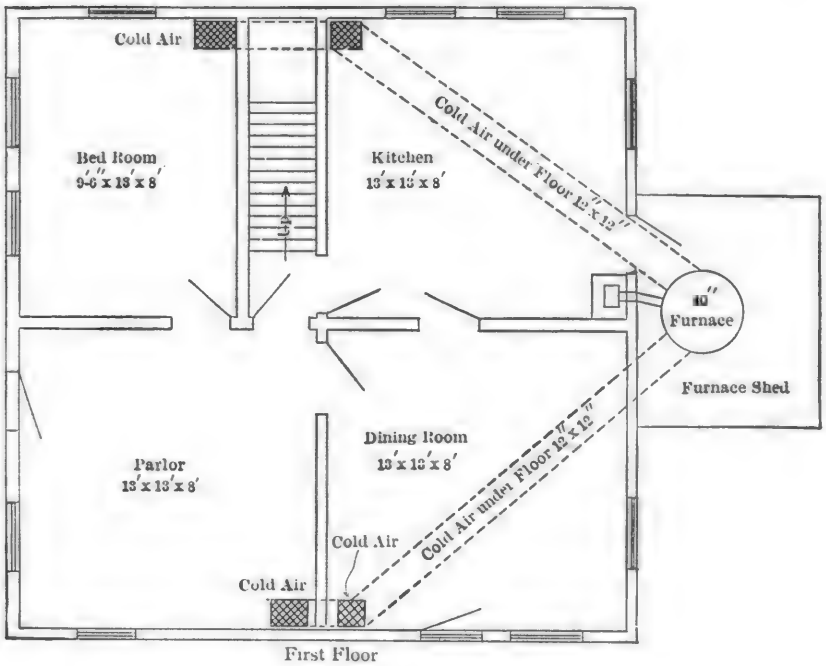
Of course this put an exposed square pipe in each of the back rooms, but as it was against ceiling and wall it could easily be incased, and did not materially mar the appearance of the rooms.

The elevation and plan was originally laid out as shown for return air ducts under the floor, connected with cold air registers in the four lower rooms and with the furnace. Owing to some changes in plan, these have never been put in, and as the system is working to the delight of the owner, it is probable they will not be, though it is certain they would greatly improve the working of the system.

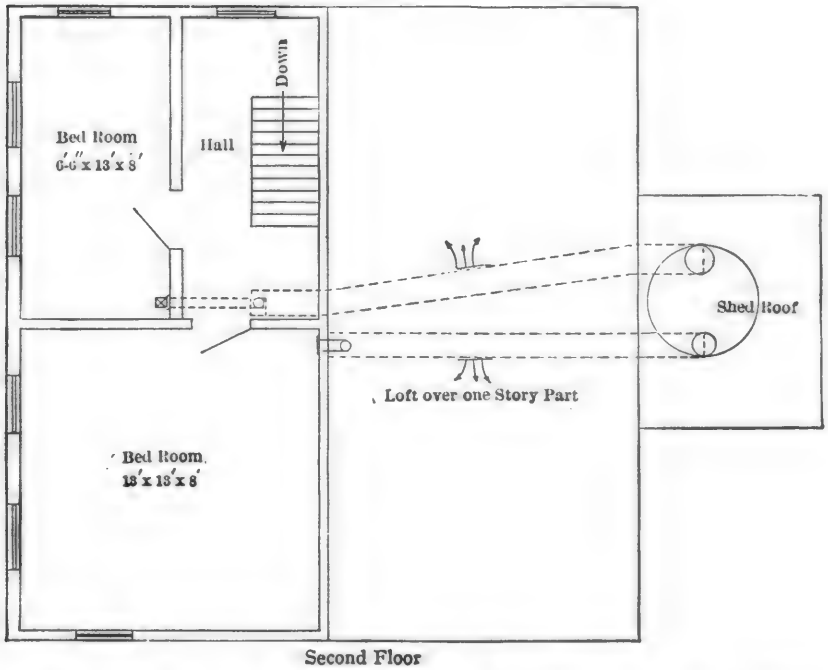


SECTIONAL VIEW OF HOUSE WITHOUT A CELLAR, SHOWING FURNACE ON GROUND FLOOR

This particular job was a makeshift, adapted to existing conditions, and put in an old house which would not warrant expensive changes in the building; but anyone can see how easily this could be adapted to other houses, if the plan were worked out before the frame was up, especially to the ordinary eight-room square house.



First Floor



Second Floor

FIRST AND SECOND FLOOR PLANS OF HOUSE WITHOUT A CELLAR, HEATED BY HOT AIR FURNACE

In such a house the second floor joists could be laid from front to back of house and four rectangular pipes could be carried between these joists and out into the furnace room, each pipe heating one first floor room with a ceiling register, and one second floor room with a floor register. The area of each of these ducts should be at least 25% larger than the combined free outlet of the registers supplied, and the register at the ceiling of the first floor room should be much larger than the register in the floor of the second floor room above it.

Ducts for the return of the air to the furnace could be carried between the joists of the first floor rooms with a cold air register in the floor of each of these rooms near an outside wall, and I should consider this a very important feature of the system. In my judgment the combined area of these return ducts should be at least 90% of that of the hot air ducts.

A little mechanical common sense will suggest modifications which will make this plan applicable to houses of other sizes and other construction. The important point is that the plan would have to be worked out before the construction of the house was commenced, and the carpenters would have to accommodate their work to it.

This system has several advantages.

There is no running down into a dark cellar to attend to a furnace. The floor of the furnace room can be on a level with the floor of the house, or not more than one or two steps down. It should, of course, be made of concrete.

The walls could be of brick, or frame, covered with galvanized iron. The top of the furnace would be so far below the roof that there would be no danger from overhead heat. It would undoubtedly be safer from fire than the usual plan.

There could be abundance of light, and consequently this furnace room could be kept much cleaner than the average furnace cellar is kept.

If the furnace were one with large "thoroughfare" (clear space inside the casing) and air ducts, both flow and return were of ample size, air could be used at a comparatively low temperature, which would improve the air in the house and prolong the life of the furnace.

While there are other reasons which make it improbable that this plan will be adopted to any considerable extent where cellars are possible, yet there are some localities where cellars are impossible, and in nearly every locality there are some houses where a cellar is impossible, and this plan may therefore extend the usefulness of the hot air furnace.

A furnace with a 24-in. firepot was used, because a second-hand furnace was available, and not because so large a furnace was necessary, as it had previously been used with satisfaction in a house of ten rooms.

(Since the meeting we have received the following discussion of Mr. Thompson's paper, which is in line with other comments made as to the impracticability of securing satisfactory results from a heating system as described by Mr. Thompson.)

A Unique Furnace Heating Plant

BY JOHN F. HALE

Several years ago I lived in a two-story frame flat building where the furnace heating system was constructed on similar lines to the one described by Mr. R. S. Thompson, and for my own satisfaction I took many observations of the temperatures, etc. These were described at one of the meetings of the Illinois Chapter last year, but no complete record has been made of them.

The building contained four flats, two on each floor, and although there was a good basement, the furnaces had been placed within the several apartments more for convenience than for any other reason.

By referring to the illustration the arrangement of the second floor will be seen, and you will observe that a special furnace room was provided as near the center of the flat as possible. This room had a cement floor,

and the walls, ceiling and door were lined with galvanized iron.

A 14 in. x 16 in. fresh air or recirculating register was provided with a damper that enabled the occupant of the room to control the air to a certain extent. Circulation was maintained through ducts run beneath the floor and connecting with 4 in. x 12 in. registers set into the baseboard, shown in the sectional elevation. These ducts connected with the fresh air duct to the furnace.

The hot air flues running from the top of the furnace in the usual way were suspended just beneath the ceiling and passed through the hall and passage way in an unconspicuous position so that they were not at all objectionable.

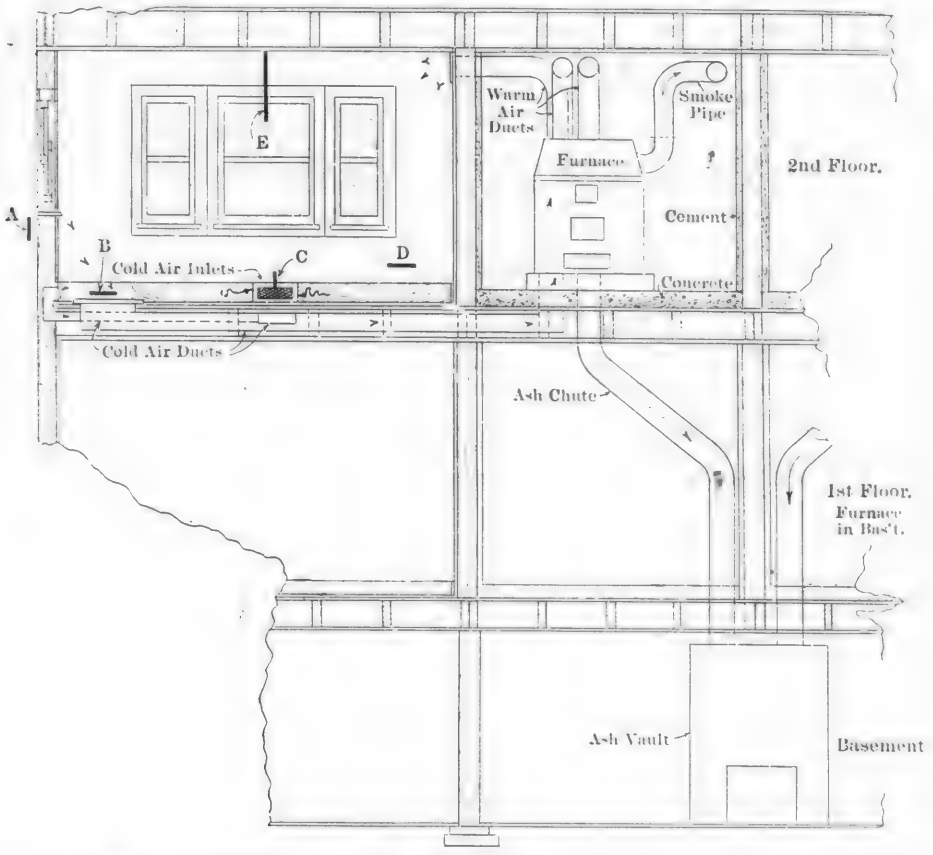
Registers were above the picture moulding and as near the ceiling as possible, resulting in the necessity for redecorating the ceiling at least once a year.

REGISTERS AND HOT AIR PIPES.

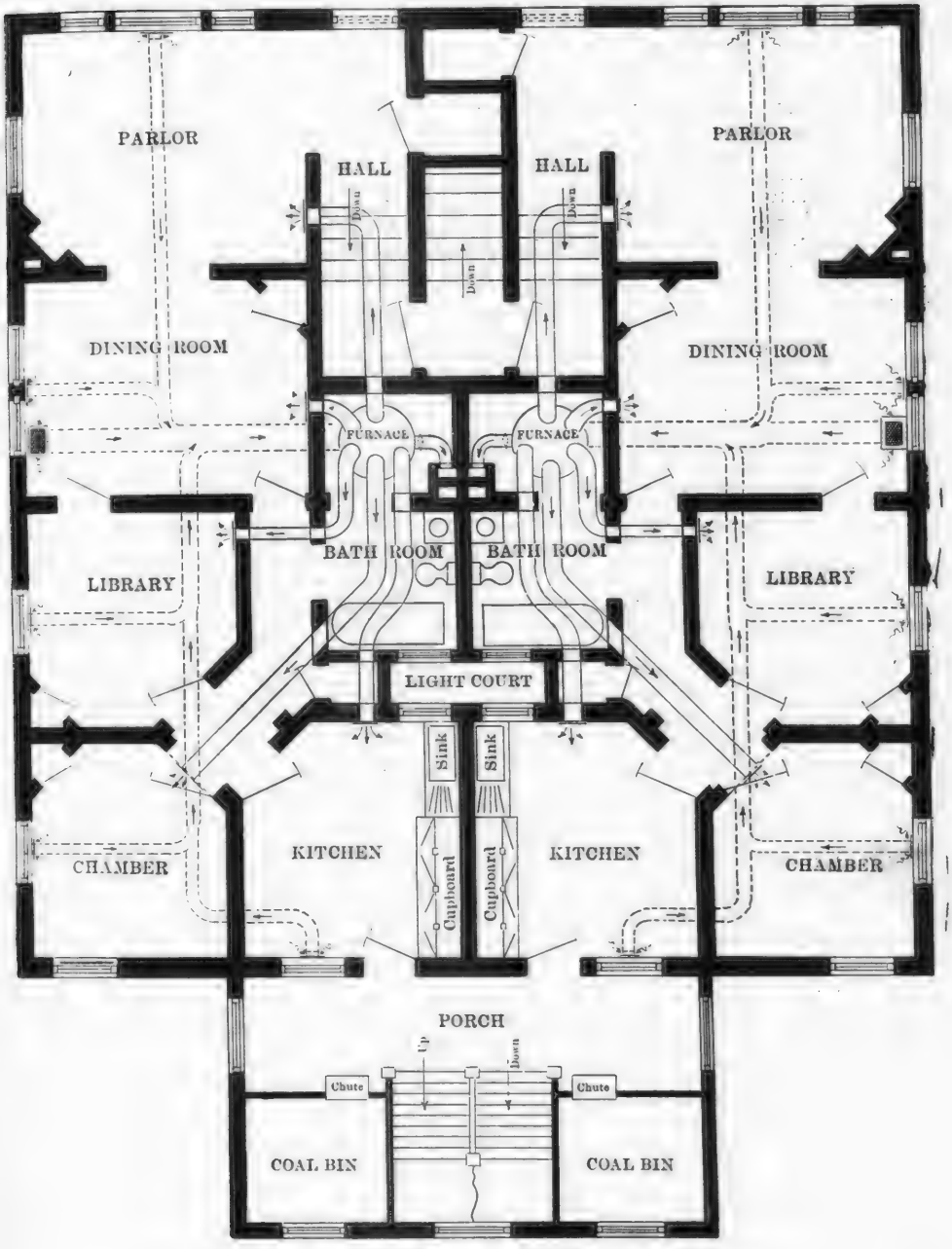
	Contents in Cubic Feet	Registers in Inches	Hot Air Pipes, in. Diameter
Parlor and front hall	1754	12x15	10
Dining room	1040	12x15	10
Library	820	11x13	9
Chamber	820	11x13	9
Kitchen	980	11x13	9
Bath room	350	10x12	8

NOTE:—Contents of inner hall added to surrounding rooms.

Coal was kept in a two-ton bin located on the rear porch and had to be carried through the kitchen, inner hall, and bath room twice a day, as there was no storage space in the furnace room. This, however, was not a serious matter as but one bucket was needed each trip. An ash chute was provided, leading to a cement vault in the basement, and it



MR. HALE'S DISCUSSION—PARTIAL SECTIONAL ELEVATION OF HOUSE SHOWING FURNACE ON FLOOR HEATED



MR. HALE'S DISCUSSION—SECOND FLOOR PLAN

avoided the necessity of handling the ashes except to open the chute once each day. It is true that up draughts frequently carried the dust into the house, but this could have been put up with if that was the only drawback.

In mild weather we had no trouble in keeping comfortable, but when the temperature lowered to the zero point, or if a wind was in one direction, it was impossible to keep comfortable. It was always found necessary to keep the temperatures at point "E" (an electric fixture in the center of the room) above 80° in order to keep the floor temperature comfortable or, say, about 65°, there always being a difference of about 17° between these points.

COMPARATIVE TEMPERATURES IN DEGREES, F.

Date	A	B	C	D	E	Wind
12/9/06	35	65	60	67	82	Variable
12/16/06	26	60	50	60	70	None
2/3/07	.....—2	56	50	55	72	N. W.
2/10/07	23	64	60	67	77	None
Average	10	64	47	54	64	

A—Outside temperature.

Although this arrangement of furnace pipes delivering the air overhead seems to be proper, it was my experience that on cold days the feet were cold while the upper portion was warm, and on mild days, when the feet were comfortable, the head was overheated.

This particular apparatus was in use one winter with all four furnaces on the floor to be heated. Later, the owners had to place the first-story furnaces in the basement and run new hot air pipes. The second-story apartments still have the overhead system; one is vacant and the tenants in the other contemplate moving before another winter.

(The report of the proceedings will be concluded in THE HEATING AND VENTILATING MAGAZINE *for September.)*

Notes of the Niagara Falls Meeting.

Among the ladies present at the recent meeting of The American Society of Heating and Ventilating Engineers, at Niagara Falls, July 24-25, were the following:

Mrs. James Mackay, Chicago.
Mrs. W. M. Mackay, New York.
Miss Mackay, New York.
Mrs. Theodore Weinshank, Indianapolis, Ind.
Miss Weinshank, Indianapolis, Ind.
Mrs. W. H. Johnson, Indianapolis, Ind.
Mrs. J. P. Dugger, Chicago, Ill.
Mrs. John K. Allen, Chicago, Ill.
Mrs. C. B. Thompson, Buffalo, N. Y.
Miss Jean McNichol, Oshkosh, Wis.
Mrs. C. E. Oldacre, Toronto, Canada.
Miss E. Olive Davis, Chicago, Ill.
Mrs. L. A. Cherry, Buffalo, N. Y.
Mrs. O. A. Morse.
Miss Helen G. Racek.

On Friday afternoon, July 24, a large automobile took the ladies on a sightseeing tour of the Falls.

In the evening, a vaudeville entertainment was provided for the members and guests by the Bureau of Publicity of Niagara Falls, in the large convention hall of the International Cataract Hotel.

Following the close of the meeting on Saturday, a demonstration lunch was given in the convention hall by the Natural Food Co., makers of Shredded Wheat. The various forms in which the cereal was prepared formed dainty dishes, of which many partook.

Several of the members accepted the invitation of the Niagara Falls Power Co. to inspect its power plant, which is one of the sights of Niagara.

Pressed Radiator Co., Pittsburg, Pa., was represented at the meeting by J. F. Siegel, of the company's Chicago office; H. Howard Armstrong, of the Pittsburg office, and Ray D. Lillibridge, of New York.

Kauffman Heating & Engineering Co., St. Louis, through Sam. Kauffman, president of the company, introduced a new air purifier to the attention of the trade, which aroused much interest and comment. The new apparatus is the invention of Prof. J. H. Kinealy, of St. Louis, and is known as the Kinealy Air Purifier and Humidifier. As the design of the spray heads is still in the patent office, a description of this portion of the apparatus was not included in the published circular which was distributed, but it was stated that special attention had been given to the defects often found in spray heads and that the new design was considered an effective solution of all spray head troubles. The eliminator consists of a number of up and down deflectors, slightly inclined to the horizontal. The down deflectors are smooth, while the up deflectors are corrugated and each is provided with a gutter on its lower front edge. The deflectors are made of galvanized iron or copper. The alternate downward and upward deflection of the air is done three times during its passage through the eliminator, the moisture carried by the air from the spray heads being taken out by the rubbing action on the surfaces of the deflectors and by the sudden changing of the direction of the air flow. The length of the apparatus is 4 ft. 6 in.

Warren Webster & Co., Camden, N. J., distributed a reminder of the Webster Air Washer and Humidifier in the shape of a blotter illustrating the air washer, and also the Webster Humidity Regulator. The company was represented by William G. R. Braemer, manager of the air washer department.

Air Cooling*

By Theodore Weinshank

In the early days when a building was being designed the question of ventilation received little consideration. At present, however, there is a great demand for fresh air, even to the extent of compulsory legislation in a number of States. In pursuance toward this end the heating and ventilating engineer is not only expected to supply the necessary amount of air, but he must deliver it comparatively pure. In doing this he occasionally finds it impossible to so locate the air intake as to keep the air free from dust, soot, etc. This latter problem is now being solved in many cases by the introduction of air washers and purifiers. As a direct consequence of this latter introduction, the humidity, as well as the cooling of the incoming air, has become of great importance.

Air passing through a sheet of water, a spray, a mist, or any other arrangement for washing the air as ordinarily provided by the manufacturers, necessarily must raise the temperature of the water through which it passes, if the same is at a lower temperature than its own, and at the same time its own temperature is lowered.

If we assume that all the passing air comes in contact with the falling water, and that a total mixture takes place, also that

W = weight of water in pounds.

T = initial temperature of water in degrees F.

t = final temperature of water in degrees F.

Since the specific heat of water is unity, then the heat absorbed by the water in British thermal units (B. T. U.) is

$$W\ (t - T),$$

while the heat given up by the air if

w = weight of air in pounds.

s = specific heat of air; $\frac{1}{4}$ approximately.

T' = initial temperature of air in degrees F.

will become

$$w\ s\ (T' - t).$$

The above two quantities are equal as per assumption of a total mixture, that is

$$W\ (t - T) = w\ s\ (T' - t)$$

solving for t, first substituting $\frac{1}{4}$ for s we have

$$Wt - WT = \tfrac{1}{4}\ w\ T' - \tfrac{1}{4}\ wt.$$

$$4\ Wt - 4\ WT = wT' - wt$$

$$t = \frac{wT' + 4\ WT}{4\ W + w} \quad . \quad . \quad (a)$$

or solving for W we have

$$W = \frac{w'(T' - t)}{4(t - T)} \quad . \quad . \quad . \quad (b)$$

In (a) if we assume that we will use an equal amount by weight of air and water, then w will be equal to W and (a) will become

$$t = \tfrac{1}{5}\ T' + \tfrac{4}{5}\ T \quad . \quad . \quad (c)$$

whence from (b) we can determine the amount of water required if we assume a final temperature t, which is in all cases greater than the original temperature of the water.

If, however, the same water is used over and over again, as is always the case where an air washer is used, then the difference in temperature between T' and T becomes zero, or T' equals T and (c) becomes $t = T'$; that is, the final temperature of the water becomes equal to the temperature of the incoming air. This is on the condition that no evaporation has taken place during the time the air and water were in contact.

Since a certain amount of evaporation does always take place, then the temperature of the air and water can never become equal, and the final mixture will always be less in temperature than the original temperature of the air, however small that difference may be.

The evaporation of a certain amount of water, or the absorption by the air of a certain amount of moisture, has presented some very

*Paper read at the Summer Meeting of the American Society of Heating and Ventilating Engineers, Niagara Falls, N. Y., July 24, 1908.

difficult problems for the heating engineer and the manufacturers of air-washing apparatus to solve.

As long as the air is of a low temperature, or of a temperature equal to that of spray water, then the air in passing through a spray or sheet of water does not absorb any moisture, and the relative humidity of the air remains as before passing through the water, but if the temperature of the air is greater than that of the water, then evaporation takes place and the relative humidity of the incoming air increases.

The greater the difference between the temperature of the air and the temperature of the water, the greater the absorbing capacity of the air, and therefore the greater the relative humidity of the air after it has been washed.

In the summer time if ventilation is used and the temperature of the air would be, say, 90°, and the relative humidity of the air before it enters the air washer would be, say, about 80%, then the air after it passes through the air washer may be at the point of total saturation. Such air, if used for ventilation, will be stifling, and will deposit moisture on any article in a room, if the same should be of a lower temperature than that of the air.

To reduce the moisture or the relative humidity of the air under conditions as stated above, means must be provided either to cool the air by refrigeration, and, so to say, squeeze the water out of it, or to dry the air by some chemical action without this cooling process.

To elaborate the former process we may consider it under two heads: First, the reduction of the moisture in the air without reducing its temperature; and, second, the reduction of the temperature of the air.

The removal of the moisture or the lowering of the humidity is of far greater importance and is a far greater expense than the cooling of the air.

To illustrate this latter statement, let us assume a condition as follows:

Outside temperature, 82°.
Relative humidity, 80%.
Desired: Inside temperature, 70°.
Relative humidity, 50%.

At 82° the weight of vapor mixed with one pound of saturated air equals .0226 lbs.; therefore, at 80% relative humidity the weight of moisture per pound of air will be

$$.80 \times .0226 = .01808 \text{ lbs.},$$

and at 50% relative humidity

$$.50 \times .0226 = .01130 \text{ lbs.}$$

Therefore, to reduce from 80% relative humidity to 50% relative humidity, there must be removed

$$.01808 - .01130 = .0068$$

pounds of vapor, the temperature remaining the same.

If the heat of vaporization at the temperature of 82° is 1058 B. T. U. per pound, then it will require

$$.0068 \times 1058 = 7.194 \text{ B. T. U.}$$

per pound of air to vaporize an equivalent amount of water.

This means that from each pound of air at the conditions mentioned above, we must remove 7.194 B. T. U. in order to condense an amount of moisture to bring the relative humidity from 80% down to 50%, whereas in order to cool the air from 82° F. to 70° F., it will require only

$$.238 (82 - 70) = 2.856 \text{ B. T. U.}$$

In order, then, to accomplish both the cooling and the removing of the humidity it will require

$$7.194 + 2.856 = 10.050 \text{ B. T. U.}$$

per pound of air. Since the weight of a cubic foot of dry air is .0733, the above may be stated as

$$10.050 \times .0733 = .737 \text{ B. T. U.}$$

per cubic foot of air per minute.

To remove this heat by a refrigerating machine, it would require work equal to about one-fifth or one-sixth of the heat removed, since the efficiency of a refrigerating machine is greater than unity. (NOTE.—The apparent paradox that the efficiency of a refrigerating machine is greater than unity is explained as follows: The working fluid, ammonia, receives heat from the brine and rejects heat into the condenser. The heat rejected into the condenser is greater than that received from the brine. The difference is found to be the heat received by the ammonia from the com-

pressor. The work to be done by the compressor is not the mechanical equivalent of the refrigerating of the brine, but only that necessary to supply the difference between the heat rejected by the ammonia into the condenser and that received from the brine. (See Ice-Making or Refrigerating Machines, Kent, page

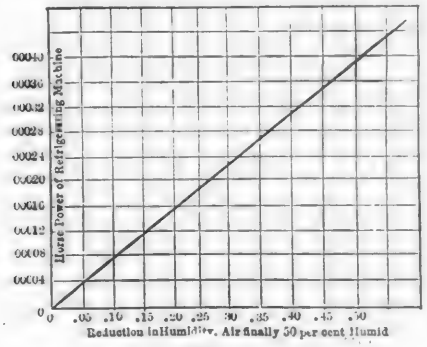


FIG. 1

988.) Hence the horsepower of a machine per cubic foot of air per minute is

$$HP = \frac{.737 \times 778}{5 \times 33{,}000} = .0035$$

To put this in a general form, let us assume that

T = original temperature of air.

t = final temperature required.

w = weight of moisture in one pound of saturated air at T degrees F.

W = weight per cubic foot dry air at T degrees.

H = relative humidity at T degrees.

h = relative humidity desired at t degrees.

L = latent heat of vapor at T degrees F.

Q = number of cubic feet of air to be cooled.

Then

$$HP = Q\frac{[.238(T-t)+Lw(H-h)]778W}{5\times 33{,}000} \quad . \quad (d)$$

Assuming that temperature to remain the same and that only the humidity is to be changed, then in (d) T and t are equal and (d) becomes

$$HP = Q\frac{Lw(H-h)778W}{5 \times 33{,}000} \quad . \quad . \quad (e)$$

The weight of a cubic foot of dry air is nearly constant between the temperature of 40° F. and 100° F. (the weight of a cubic foot of dry air at 42° is .079, and at 100° is .0707). Hence, we may assume the following conditions:

Let W be constant, then Lw at the desired temperature of 70° F., and 50% relative humidity, also will be constant, and (e) becomes

$HP = (H - h).0008$ when Q is unity.

With the horsepower and $(H - h)$ being the only variables in the equation, we may take $(H - h)$ as abscissae and horsepower as ordinates and produce a curve as shown in Fig. 1.

In (d) if we assume that the relative humidity is maintained constant, and that the temperature only is changed, equation (d) becomes

$$HP = \frac{.238(T-t)778W}{5 \times 33{,}000} \quad . \quad . \quad (h)$$

Again, considering W as constant and $Q = 1$, equation (h) becomes

$$HP = (T - t)\ .00008 \quad . \quad . \quad . \quad (k)$$

With the horsepower and $(T - t)$ being the only variables, if we work out the results for a range of from 5° to 30°, the curve shown in Fig. 2 is obtained.

The sum of the horsepower of the two curves will give the required

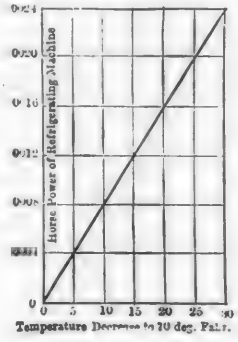


FIG 2

power for any other condition, assuming that 70° and 50% relative humidity to be the standard for ventilating purposes.

The horsepower thus obtained for different temperatures and different percentages of humidity is on the basis of a refrigerating apparatus or

an ice-making apparatus of direct expansion type.

If a moderate temperature brine type apparatus is used, the horsepower required, and hence the cost of the air-cooling installation, will be somewhat increased.

It is obvious that the latter system requires twice the expense for coils or pipe surface, and also requires twice the temperature interval between the temperature of the expending ammonia and the temperature of the air, required by the direct expansion system, since the heat requires to be transmitted through the walls of two sets of pipes instead of one.

This, of course, means that the power required would be increased in the same degree, and the cost of equipment in the same degree also.

The brine system, however, is the most desirable, since there is more opportunity to automatically control the temperature of the brine for different requirements of outside temperature and relative humidity.

A humidostat can be placed in the main discharge pipe of the ventilating fan to properly control the flow of the brine into the cooling coils, and thereby control the temperature of the cooling coils so that a constant relative humidity and any desired temperature may be obtained.

Since blast coils are used in connection with ventilating fans for winter use, the same coils can be used for cooling purposes in the summer time, as the temperature of the brine used for such purposes is never such that it will cause the pipes to be covered with ice, so as to reduce the free area through same.

*Coefficient of Transmission in Cast-Iron Radiation**

By John R. Allen

The results given in this paper are from tests made to determine the variation of the coefficient of conduction with different temperatures of steam and air on the two sides of a cast-iron radiator. These tests were conducted in the laboratory of the engineering department of the University of Michigan.

METHOD OF MAKING TEST

These tests were conducted in the usual manner, but under a wide range of conditions. The steam pressure was varied from seventy pounds gage pressure per square inch to atmospheric pressure, and the room temperature from 117° to 51° F. The number of tests made was seventy-six. During all the tests the humidity of the atmosphere was noted. As will be noticed in Table I, the moisture was extreme in certain cases. These excessively high percentages of moisture were obtained by introducing steam into the air of the room.

In every test two radiators were tested. One which is permanently located in the testing plant, termed the Standard radiator; the second, which may be changed from time to time, is termed the test radiator. During these tests the standard radiator was a cast-iron radiator of the two-column type, and the test radiator a cast-iron radiator of the three-column type. These radiators are similarly situated in the room. Most of these tests were made at night to avoid the effects of the sun.

RESULTS OF THE TESTS

The results of the tests are shown in Table I.

The particular object of the tests was to obtain the coefficient of transmission, as shown in columns 16 and 17. The coefficient of transmission is obtained by dividing the B. T. U. transmitted per square foot of radi-

*Paper read at the annual meeting of the American Society of Heating and Ventilating Engineers, and published at the Summer meeting, Niagara Falls, July 24-25, 1908.

Table I

No of Test	Date	Outside Temperature	Relative Humidity	Barometer	Gauge Pressure	Absolute Pressure	Temperature of Steam	Average Room Temperature	Temperature Difference	Btu per sq ft per hr per deg Diff of Steam Condensed	Std Radiator Condensation	Test Radiator Condensation	Btu per sq ft per hr per deg Diff Std Radiator	Btu per sq ft per hr per deg Diff Test Radiator	Equivalent Direct Std Radiator	Equivalent Direct Test Radiator	Heating Power of Steam
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	2-22	40	47	29.73	3.01	6.47	297.3	51.2	246.3	89.60	2874	2380	6340	5850	2245	2376	99
2	2.26	21	59	29.58	68.3	82.66	339	82.9	256	89.80	2707	2141	5930	5320	2230	2244	99
3	2.27	14.9	84	29.44	66.7	81.16	328	58.9	254.9	88.65	3004	2347	5710	6700	2228	2221	99
4	2.27	15.0	91	29.44	70	84.46	335.6	69.6	256.0	88.4	3019	2436	5765	5950	2262	2323	99
5	3.1	31.1	45	28.89	66	79.08	311	78.3	232.1	88.66	2600	1986	4746	4774	2048	2050	99
6	3.5	26.4	94.4	29.24	69.4	83.76	316	81.1	233.9	88.3	2430	1961	4620	4760	2018	2037	99
7	3.7	33.9	67	28.76	69.8	84.0	316.2	98	217.2	88.14	2490	1960	4630	4735	2130	2177	98
8	3.8	33.3	53	29.43	64.9	79.36	311.2	97.3	213.9	88.56	2356	1889	4490	4580	2100	2140	98
9	3.8	29.3	58	29.43	58.3	69.76	302.5	93.2	209.3	88.07	2330	1870	4410	4580	2180	2187	98
10	3.12	26.1	43	28.87	54.7	68.88	304.8	106.1	198.8	88.46	2092	1674	4000	4400	2046	2078	99
11	3.12	43.3	45.5	28.83	55.3	69.48	299.9	103	196.9	87.06	2021	1618	3880	3942	2055	2088	99
12	3.14	31.8	54	29.30	56.4	69.79	296.8	85.7	194.1	90.19	2005	1626	3923	4046	2000	2060	99
13	3.15	40.8	47	28.99	30.6	45.1	274.9	91.6	183.9	91.56	1814	1446	3675	3680	1956	2015	99
14	3.16	40.6	53	29.60	26.8	40.0	267.1	90.7	176.4	91.96	1775	1443	3506	3640	1908	2062	99
15	3.19	46.9	99	28.97	20.0	35.2	257.5	92.4	165.1	91.49	1596	1228	3178	3114	1898	1864	99
16	3.19	35.1	49	28.97	30.9	46.1	274.4	95.0	179.4	91.46	1798	1476	3520	3620	1962	1965	99
17	3.21	51.5	56	28.84	10.6	24.82	237.2	95.8	144.0	94.00	1350	1038	2730	2730	1870	1862	99
18	3.22	65.8	65	29.05	10.8	25.06	240.1	103.9	136.2	93.89	1204	939	2430	2670	1770	1800	98
19	3.22	68.5	45	29.40	20.4	39.66	262.6	101.8	160.8	93.49	1436	1149	2857	2815	1886	1926	99
20	4.6	41.5	45	29.20	18.6	38.93	258.9	90.7	168.2	93.00	1384	1067	2730	2688	1830	1802	99
21	4.6	38.0	38	29.14	18.6	38.90	258.8	96.6	162.2	93.00	1384	1082	2622	2622	1810	1820	99
22	4.9	33.0	72	28.65	19.9	38.97	258.9	90.7	168.2	93.97	1826	1715	3418	3160	1811	1900	96
23	4.10	40.7	72	28.89	19.8	38.90	257.5	91.8	165.7	93.12	1506	1172	3171	2947	1844	1833	98
24	4.10	32.2	65	29.00	68.3	82.56	314	108.7	205.3	87.61	2245	1761	4234	4240	2070	2073	98
25	4.11	43.0	64	28.94	19.8	38.93	258.9	106.8	152.1	89.51	2030	1480	3890	3635	2144	2004	98
26	4.13	36.3	76	28.18	19.8	38.9	258.6	89.4	169.2	88.93	2215	1710	4336	4168	2040	2010	98
27	4.18	37.2	93	29.10	20	16.32	217.3	91.0	126.3	96.00	1008	838	2490	2210	1734	1730	98
28	4.19	48.3	87	29.16	62	1.93.2	284.6	104.8	179.8	94.60	1060	846	2558	2489	1729	1754	99
29	4.19	41.0	95	29.20	94	23.85	275.8	117.8	158.0	94.02	1011	780	2411	2039	1702	1699	98
30	4.22	62.8	99	29.24	14.5	28.77	249.9	104.1	145.8	93.10	1326	1039	2461	2428	1830	1826	98
31	5.2	58.6	68	29.23	2.6	17	221.5	104.1	117.1	96.06	968	769	1970	1867	1689	1693	99
32	6.2	44.5	59	29.20	1.63	16.03	217.9	101.0	116.9	96.32	1002	747	2070	1971	1786	1693	99
33	5.3	37.9	51	29.18	1.48	15.79	218.6	108.2	110.4	96.58	944	721	1938	1900	1810	1669	99
34	6.8	64.8	39	29.16	7.4	22.06	246.5	105.8	140.7	95.50	914	678	1896	1846	1814	1669	99
35	5.9	73.1	40	29.06	7.0	21.98	212.7	106.0	106.7	96.58	897	647	1860	1716	1730	1578	99
36	5.10	38.6	41	29.17	8.6	23.17	249.8	99.1	150.8	96.48	1018	775	2106	2020	1746	1677	99

TABLE I.—RESULTS OF RADIATOR TESTS

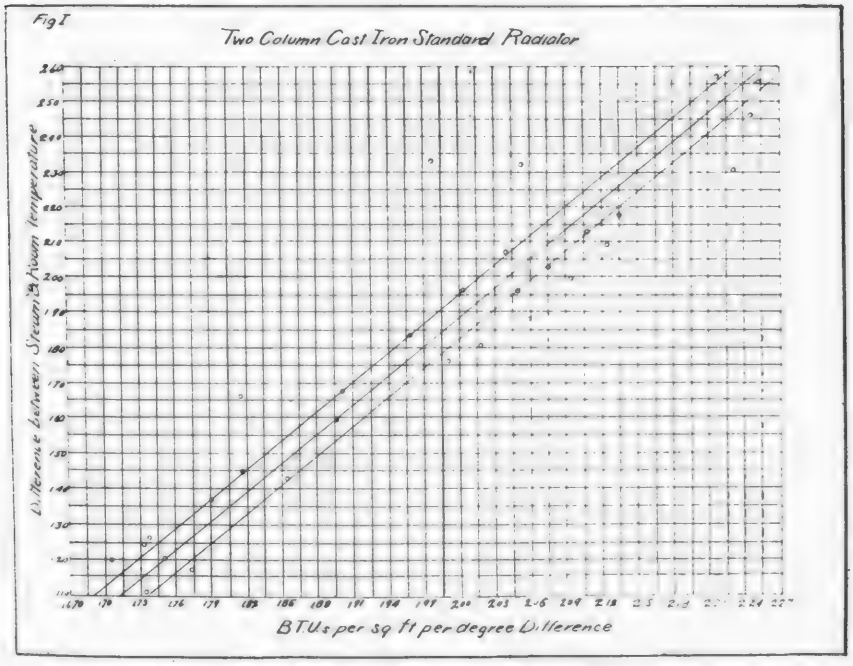


Fig I
Two Column Cast Iron Standard Radiator
Difference between Steam & Room Temperature
BTUs per sq ft per degree Difference

FIG. 1.—PLOTTED RESULT OF TESTS ON TWO-COLUMN CAST-IRON STANDARD RADIATOR

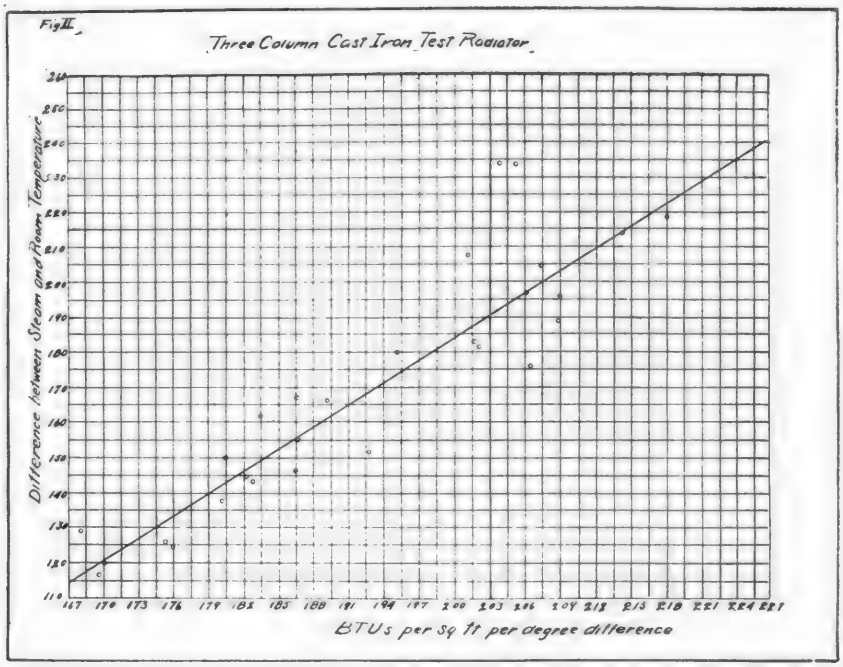


Fig II.
Three Column Cast Iron Test Radiator
Difference between Steam and Room Temperature
BTUs per sq ft per degree difference

FIG. 2.—PLOTTED RESULT OF TESTS ON THREE-COLUMN CAST-IRON STANDARD RADIATOR

ation per hour by the difference between the steam and room temperature. In the curve shown in Fig. 1 the coefficient of transmission for the two-column radiator has been plotted as abscissae, and the difference between steam and room temperature as ordinates.

In Fig. 2 the coefficient of transmission for the 3-col. radiator has been plotted in the same way as in Fig. 1. From the curves in Figs. 1 and 2, Table II has been obtained. From Fig. 1 we get the equation representing the variation of the coefficient of transmission with the change in difference between steam and room temperature.

TABLE II

COEFFICIENT OF HEAT TRANSMISSION

Difference in temperature between steam and room	B.T.U. per sq. ft. per hour per degree difference of temperature	
	2 col. radiator	3 col. radiator
110	1.71	1.65
120	1.745	1.695
130	1.76	1.745
140	1.82	1.79
150	1.855	1.835
160	1.895	1.885
170	1.93	1.93
180	1.965	1.98
190	2.00	2.025
200	2.04	2.075
210	2.075	2.12
220	2.11	2.165
230	2.15	2.215
240	2.185	2.260
250	2.22	2.31
260	2.265	2.36

If we let

c = coefficient of transmission,

t_1 = temperature steam in the radiator,

t_2 = temperature of the room,

then from the results obtained

$C = .0036\ (t_1 - t_2) + 1.32$ for a 2-col. cast-iron radiator,

$C = .00467\ (t_1 - t_2) + 1.14$ for a 3-col. cast-iron radiator.

The most interesting application of this equation is in determining the temperature of a room for various conditions of the outside temperature. The case often arises where a contractor guarantees to heat a building to 70° with a temperature outside at 0°. When the heating plant is finished what temperature should the room be heated with a higher temperature than 0° outside in order that the building may be heated to 70° with 0° outside? This equation permits of a more accurate solution of this problem. The following demonstration gives a solution of this problem:

Assume t = temperature of the outside air for contract condition.

Assume t_2 = temperature of air in the room which was guaranteed by contractor.

Assume t_3 = temperature of steam in the radiator during test.

Assume t_4 = actual temperature of outside air during test.

Assume t_5 = computed temperature of room for test conditions.

Heat loss from room under contract conditions.

$$=\left(\frac{W}{4}+G\right)n(t_2-t_1) \quad . \quad . \quad . \quad (1)$$

Heat loss from radiator under contract conditions.

$$=(t_3-t_2)[.0036(t_3-t_2)+1.32] \quad . \quad . \quad (2)$$

Heat loss from room under test conditions.

$$\left(\frac{W}{4}+G\right)n(t_5-t_4) \quad . \quad . \quad . \quad . \quad (3)$$

Heat loss from radiator under test conditions.

$$(t_3-t_5)[.0036(t_3-t_5)+1.32 \quad . \quad . \quad . \quad (4)$$

Equation (1) must equal equation (2), therefore transposing.

$$\left(\frac{W}{4}+G\right)n=\frac{(t_3-t_2)[.0036(t_3-t_2)+1.32}{t_2-t_1} \quad (5)$$

and equation (3) must equal equation (4), therefore transposing.

$$\left(\frac{W}{4}+G\right)n=\frac{(t_3-t_5)[.0036(t_3-t_5)+1.32}{t_5-t_4} \quad (6)$$

Equating the right-hand member of these equations we have

$$\frac{(t_3-t_2)[.0036(t_3-t_2)+1.32]}{t_2-t_1}=\frac{(t_3-t_5)[.0036(t_3-t_2)+1.32]}{t_5-t_4} \quad . \quad (7)$$

The unknown quantity in this equation is t_5, and this is involved as a quadiatic, so that the general solution of the equation is a difficult one. It is customary to assume, however, that the outside air t_1 — 0°, the room temperature t_2 — 70°, and steam pressure in the radiator is 5 lbs. per square inch, then t_3 — 227. Substituting these values in equation (7) we have

$$4.15=\frac{(227-t_5)[.0036(227-t_5)+1.32]}{t_5-t_4} \quad . \quad (8)$$

$$4.15(t_5-t_4)=.0036(227-t_5)^2+1.32(227-t_5) \quad . \quad (9)$$

Solving this equation as a quadratic for t_5 in terms of t_4 we get

$$t_5=987-\sqrt{840,000-1,153t_4} \quad . \quad . \quad . \quad (10)$$

for a two-column cast-iron radiator.

For the three-column cast-iron radiator this equation becomes

$$t_5=793-\sqrt{523,000-887t_4} \quad . \quad . \quad . \quad (11)$$

As an example, suppose a heating contractor guarantees to heat a house to 70° in zero weather with 2-col. cast-iron radiation. When the house is finished the lowest temperature obtainable is 40°. What should be the temperature in the house with 40° outside in order to fulfill the original guarantee? Substituting 40° for t_4 in the above equation, we find as the result that the temperature of the house should be 97°.

TABLE III

ROOM TEMPERATURE CORRESPONDING TO TEMPERATURE OF OUTSIDE AIR

Temperature of outside air	Temperature of room 2 col. radiator	Temperature of room 3 col. radiator
—30	52	53
—20	58	59
—10	64	64
0	70	70
10	77.5	75
20	83	83
30	90	89
40	97	95
50	103.5	105.5
60	110	108
70	117	115
80	123.5	121.5
90	130	128
100	137	134.5

Table III shows the temperature that should be obtained in a room for various outside temperatures, the original guarantee being to heat the house to 70° in zero weather. The table is computed by substituting in equation (10). Table III has been plotted in the form of a curve shown in Fig. 3, and from this table intermediate points can be obtained.

APPROXIMATE EQUATION

If we ignore the difference in the change of the coefficient of transmission and assume it a constant, then equation (7) reduces to

$$\frac{t_3-t_2}{t_2-t}=\frac{t_5-t_4}{t_3-t_5} \quad . \quad . \quad . \quad . \quad . \quad (12)$$

Making the same assumption as in equation (8), equation (12) becomes

$$t_5 — .693t_4 + 70.$$

In using this approximate expression the error is about 2% at 40° and about 10% at 100° outside temperature. This shows that in most cases where this computation is made the use of the more exact expression is not necessary.

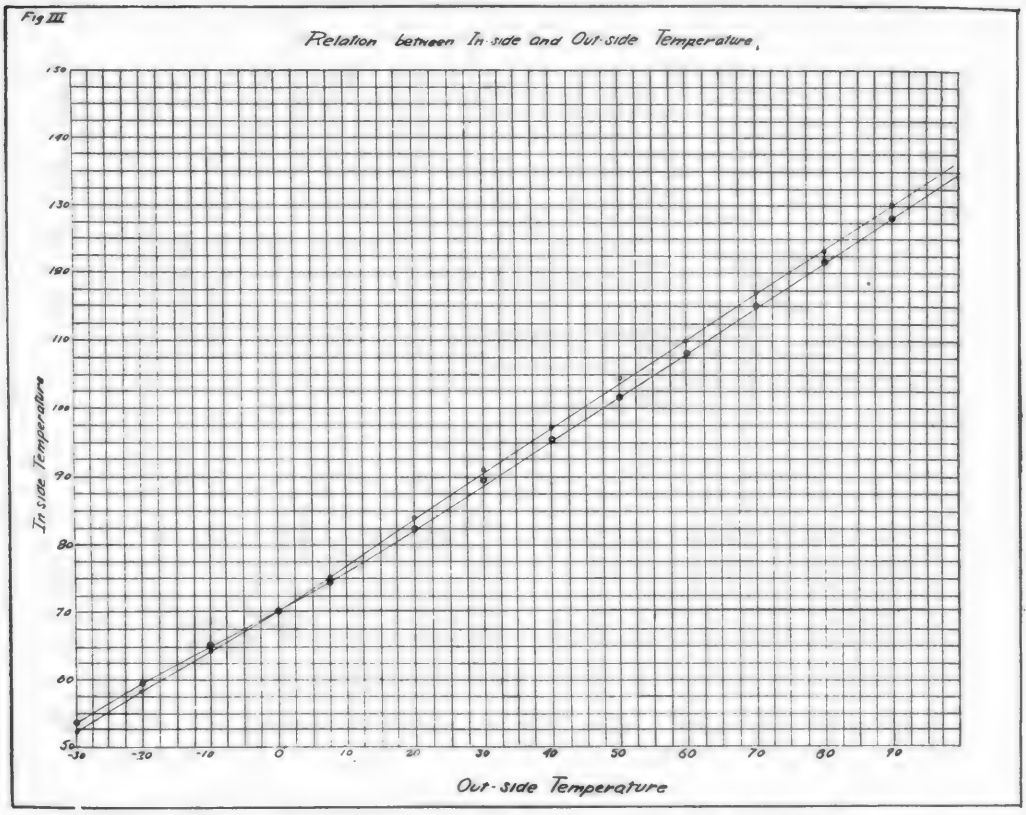


FIG. 3.—RELATION OF INSIDE TO OUTSIDE TEMPERATURES

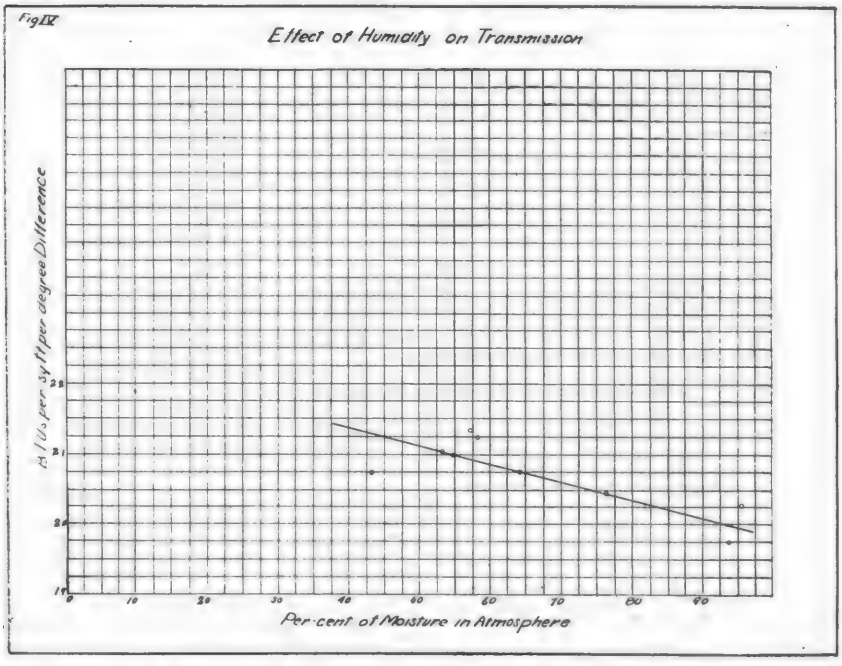


FIG. 4.—EFFECT OF HUMIDITY ON THE TRANSMISSION OF HEAT THROUGH RADIATOR

Fig. 4 shows the effect of moisture in the atmosphere upon the transmission of heat through the radiator. This curve is plotted for difference of temperature between steam and air varying from 244° to 200°. The per cent. of moisture in the air is plotted as abscissae and the B. T. U. transmitted as the ordinates. The curve indicates that the rate of transmission of heat diminished as the per cent. of moisture in the atmosphere increases. The extreme range of moisture ordinarily met with in any locality varies from 40% to 90% of saturation. This extreme variation in moisture produces a change in the coefficient of transmission of approximately 5%.

The earlier radiator tests conducted at the University of Michigan were made in a room having a small amount of glass surface. Two years ago a new radiator testing plant was built. In this plant the room in which the radiators are tested contains about 40% glass surface.

The difference in the results obtained were at once very marked. Under the new conditions the coefficient of heat transmission in the test radiator was increased from 1.68 to 1.86, or an increase of 10.7%. This would account in a large measure for the different results obtained by different experimenters on the same form of radiator.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

President Mackay Names New Members of Compulsory Legislation Committee

At a meeting of the Board of Governors in Chicago, August 20, President James Mackay announced the appointment of the additional New York members of the Committee on Compulsory Legislation to carry out the society's resolution to combat any efforts to repeal the recently enacted New York State factory-ventilation law. The following were named, being all the past presidents of the society from New York State: C. B. J. Snyder, Prof. R. C. Carpenter, Prof. William Kent, William M. Mackay, D. M. Quay and Edward P. Bates.

National Association of Master Plumbers.

A feature of the recent convention of the National Association of Master Plumbers, in Boston, July 14-16, last, was the opening of the sessions to non-members as well as members during all of the deliberations.

The address of the retiring president, T. A. Hill, of New York, was an able review of the work of the year, in which the adverse conditions arising from the prosecution of master plumbers' associations, resulting in a loss in membership, especially in Ohio, were frankly discussed. Illegal combinations, said President Hill, is something the National Association in all its literature and printing has advised and repeatedly cautioned against.

President Hill told of the conferences that have been held with officers of the Department of Justice in Washington during the past year, after representations had been made to the Department that the National Association was an unlawful combination restricting prices and work. While no definite steps were taken as a result of the conference, President Hill stated that many misconceptions were removed and that the association stood in a much better light with the department as a result of the interviews.

A noteworthy action taken at the convention was in regard to the replacement of defective parts. A resolution in favor of adopting the use of the rubber stamp on orders providing for the replacement of defective parts was introduced by the New Jersey State Association. The Committee on Resolutions acted adversely on the matter.

This, however, did not settle the question, for subsequently the Master Plumbers' Association of Rochester submitted a similar resolution which recommended that the association 'adopt and recommend the use by all members of the national, State or local associations of the following notation on all purchase orders for material, either in printed form or by use of rubber stamp:

"Should any of the goods on this order prove defective through manufacture before or after installation, such goods will be replaced free of expense to the purchaser."

The Resolutions Committee again reported unfavorably on this resolution on the ground that it was practically the same as the one previously submitted.

The convention thereupon voted to reject the report of the Resolutions Committee and then adopted the "rubber stamp" resolution by a large majority.

W. H. Halsey, of Milwaukee, was elected president for the ensuing year.

THE HEATING AND VENTILATING MAGAZINE

Vol. 5 August, 1908 No. 8

PUBLISHED MONTHLY AT
1123 BROADWAY, NEW YORK
BY THE
HEATING AND VENTILATING MAGAZINE CO.
Secretary and Treasurer, A. S. ARMAGNAC
The address of the officers is the address of this magazine.

A. S. ARMAGNAC, Editor — G. PETERSEN, Advertising Mgr.

European Representative:
AMERICAN PUBLICATION BUREAU, 31, Overton Road, Leicester, England

Subscription, - - - - - - $1.00 per year
Foreign countries, - - - - - 1.50 " "
Back numbers, - - - - - - 15 cents a copy

Manuscripts submitted for publication must in every case be accompanied by postage; otherwise they will not be returned.

A NEW ventilation law which may mean much or little, according to the way it is interpreted by the man responsible for its enforcement, has been placed lately on the statute books of New York State. It relates to the ventilation of factory buildings and is intended, apparently, to compel the installation of mechanical ventilation apparatus in buildings or lofts where large numbers of workers are housed together in closed spaces. Like the New Jersey ventilation law, this act is hidden away in the "Laws Relating to Labor and Factories," and appears as an amended act under Article 6, Section 86. It became effective in October, 1907.

The law states that "the owner, agent or lessee of a factory shall provide, in each workroom thereof, proper and sufficient means of ventilation and shall maintain proper and sufficient ventilation; if excessive heat be created or if steam, gases, vapors, dust or other impurities that may be injurious to health be generated in the course of the manufacturing process carried on therein, the room must be ventilated in such a manner as to render them harmless, as far as practicable. In case of failure, the commissioner of labor shall order such ventilation to be provided." Failure to comply with the law within 20 days is punishable by a fine of $10.00 for each day thereafter.

Under the present chief inspector of factories, W. W. Walling, the law is being interpreted strictly and, as a result, the owners and landlords of such buildings are complaining bitterly of the trouble and expense imposed upon them in living up to its requirements. A number of such owners who are members of the Realty League of New York, are making it their special object to bring about the repeal of the law.

THE only organized efforts made so far to offset the work of these members of the Realty League have been undertaken by The American Society of Heating and Ventilating Engineers. That body took prompt action when its attention was called to the matter at the recent meeting in Niagara Falls, by assigning to several of its New York State members the special duty of furthering the sentiment for the law as it stands, as well as backing up the efforts of the Factory Inspection Bureau in securing its rigid enforcement. The owners and landlords, it has been learned, are already at work in a systematic way, to have the law repealed this Fall and it will require prompt and vigilant action on the part of the heating fraternity to thwart such a programme.

THIS is a matter that should attract interest and co-operation

outside of the limits of any single organization. Methods of procedure will suggest themselves when it is stated that the landlords are approaching individually the members of the State Legislature on the subject. Similar action at the present juncture on the part of all interested in the maintenance of the act will probably prove effective while delay may be both costly and irremediable.

COPIES of the New York State Factory Ventilation Law, printed on cardboard, may be had from THE HEATING AND VENTILATING MAGAZINE for two cents each. The new law will also be incorporated in the booklet published by this journal, at 10 cents each, containing all the ventilation laws now in force in this country.

WHILE investigating the air conditions of some of New York's office buildings, some interesting figures were obtained regarding one of the largest of the city's downtown office buildings and one which has very little unrented space at any time. It is occupied by shipping and engineering bureaus employing a considerable number of clerks and draftsmen, and is found to have a normal tenancy of 2,200 persons on 15 stories above the ground floor. The floor heights average nearly 12½ feet, with a net ceiling height of 11 feet. The rented or occupied portion of the 15 floors is 2,475,000 cubic feet, or 225,000 square feet, a proportion of one person to 112 square feet. A recent lease brought into the building an additional staff of nearly 250 employees in one section, making the total population 2,450 persons, and bringing the relation of occupant to area to 101 square feet. With the ceiling height of 11 feet, the cubical space per occupant thus became 1,110 cubic feet, which would have corresponded to 110 square feet, with a 10-foot ceiling.

ONE OF the reasons given for the dissolution of the business of the New Haven (Conn.) Heat Supply Company, which supplied steam heat from a central station to a number of buildings in that city, is that the plant, which was an old-fashioned one, would cost more to repair than the outlay was worth. That in itself, however, was not the only determining factor. The purchase of the plant by the United Illuminating Company, of the same city, is explained on the ground that the illuminating company is doing extensive work in laying underground electric wire conduits in New Haven and found that the escaping steam from the heating company's pipes damaged these conduits as well as those of the fire alarm system.

A SEQUEL to the movement for the conservation of natural resources is the recent action of the Kentucky Heating Company to prevent a rival firm, the Kentucky Gas Company, from wasting natural gas taken from wells adjoining the complainant's property. The gas company, it was claimed, had drilled wells near those of the other company's plant and had turned the gas loose into the air with the object of depleting its rival's supply. An injunction was secured against the offending company and, in a suit for damages, a judgment was rendered in favor of the heating firm for $60,000. On appeal, the judgment of the lower court has been reversed, due, however, only to errors, and a new trial ordered.

Identification of Power House Piping by Colors*

By William H. Bryan

With the growth of modern power plants in number and magnitude, there has come a corresponding increase in the extent, variety and complication of their service, and the multiplicity of their pipe lines. These carry gases or liquids, varying in kind, quality, pressure, temperature, purpose and direction. The usual steam and water lines are of almost endless variety, with drains and drips to match, besides oil, air, gas and often ammonia and brine—each subject to further special uses and subdivisions. The situation is confusing, even to the experienced and expert attendant; what it means to the men of ordinary experience and to new men coming into the plant may be imagined. In times of emergency and excitement the manipulation of a wrong valve may not only delay the righting of things, but often adds to the confusion, and may even cause disaster.

It has come to be realized, therefore, that some method of quick and positive identification of pipe lines is not only desirable but is absolutely essential to insure the highest safety and efficiency of operation.

These facts impressed themselves strongly upon the writer some months ago when designing the power plant for a large department store in Los Angeles. Until recently it has been the custom to paint pipe lines one uniform color. Attempts at identification have been made by attaching tags to valves, a step in the right direction. Colors have been used to a limited extent in the East, but very few data in that direction have been available. To fit the Los Angeles case the writer worked out a color scheme, which was later published in one of the engineering monthlies.* Although incomplete and of somewhat limited application, it brought out considerable favorable comment, and was republished in a number of journals. One journal is to illustrate a plant by reproducing the pipe lines in color in accordance with the proposed scheme. All this impressed the writer with the belief that there was need of a more comprehensive and well-digested system. He there-

Read at the Detroit meeting (June, 1908), of The American Society of Mechanical Engineers.

*This article was republished in The Heating and Ventilating Magazine for April, 1908.

TABULATION OF COLOR SCHEMES FOR PILE LINES

No. 1 Bureau of Steam Engineering, U. S. Navy

Pipe lines	Colors of pipe	Colors of bands, couplings, flanges, valves, or fittings
Steam, supply	White	Black
Steam, exhaust	White	Red
Feed pump-suction (fresh water)	Gray	Black
Feed pump-delivery (fresh water)	Gray	Red
Steam pump, suction (salt water)	Green	Black
Steam pump deliveries and flushing pipes (salt)	Green	Red
Hydraulic, supply (fresh)	Blue	Black
Hydraulic exhaust (fresh)	Blue	Red
Main, auxiliary and all other drains, sounding pipes and air vents (salt)	Pink	Same
Fire service (salt)	Red	Same
Flood pipes for magazine and trimming tanks (salt)	White with red Diamond	Black
Pneumatic service	Black	Same
Ventilating supply	Yellow	Black
Ventilating exhaust	Yellow	Red

No. 2 Pa., N. Y. & L. I. Ry. Co., Long Island City, N. Y.

Steam-high pressure (superheated)	White	Same
Steam (saturated)	Bright red	Black
Exhaust from auxiliary apparatus	Yellow	Same
Drips from superheated steam, including the Holly system and connection to boilers	Bright red	Same
Holly system connections from saturated steam	Bright red	Black
Low pressure drips	Yellow	Same
Blow-off	Maroon	Same
Boiler feed from pumps to boilers, including heaters, economizers and their connections	Black	Same
Fire protection system	To match adjacent structural steel	Same
All other water lines	Blue	Same
Crank case oil between engines and separators	Slate	Same
All other oil lines	Brass unpainted	Same
Air	Green	Same

No. 3 Waterside Station, New York Edison Company, New York.

Steam, high pressure to engines, boiler cross-overs, leaders and headers	Black	Brass
All other steam lines	Buff	Black
Steam, exhaust	Orange	Red
Steam, drips including traps	Orange	Black
Steam trap discharge	Green	Black
Blow-offs, drips from water columns and low pressure drips	Slate	Red
Drains from crank pits	Dark Brown	Blue
Cold water to primary heaters and jacket pumps	Blue	Red
Feed water, pumps to boilers	Maroon	Same
Hot water mains, primary heaters to pumps, and cooling water returns	Green	Red
Air pump discharge to hot well	Slate	Black
Cooling water, pumps to engines	Blue	Black
Fire lines	Vermilion	Same
Cylinder oil, high pressure	Brown	Black
Cylinder oil, low pressure	Brown	Green
Engine oil	Brown	Red
Pneumatic system	Black	Same

No. 4 BOSTON ELEVATED RAILWAY COMPANY, BOSTON, MASS.

Steam, high pressure	Black	Same
Steam, low pressure	Orange	Same
Exhaust steam, to floor line	Color of engine	Same
Exhaust steam, below floor line	Buff	Same
High pressure drips to Holly receiver or traps	Black	Red
Hot water returns from Holly receivers and high pressure traps to boilers	Green	Red
Low pressure drip to trap	Orange	Black
Discharge from low pressure traps	Buff	Black
Cold feed water, to primary heaters, toilets, sinks, etc.	Blue	Same
Hot feed water, primary heaters to boilers	Green	Same
Fire service	Red	Same
Salt water intake	Slate	Black
Salt water discharge	Slate	Red
Cylinder Oil	Yellowish brown	Black
Engine oil	Yellowish brown	Red
Air	White	Same
Gas	Slate	Same

fore instituted an investigation to learn what had already been done, and has tabulated the results as follows:

No 1. Bureau of Steam Engineering, U. S. Navy. Used on U. S. vessels, and on drawings for ship's files. In general a black band or coupling indicates a supply or suction pipe, and a red band or coupling an exhaust or delivery pipe. Furnished by Mr. Alfred H. Raynal, Member A. S. M. E.

No. 2. Designed by Westinghouse, Church, Kerr & Co., for the power plant of the Pennsylvania, New York and Long Island Railway Co., Long Island City, N. Y. Mr. Henry R. Kent, member A. S. M. E., vice-president of this company, states that they use substantially the same system in all their large work, and that it has become practically standard with them.

No. 3. Waterside Station, New York Edison Company. Supplied by Mr. W. F. Wells, former superintendent.

No. 4. Boston Elevated Railway Co. Arrows are stenciled on the pipe lines showing direction of flow; also, where practicable, brief notes stating what the pipe is for. Data furnished by Mr. Jos. D. Andrews, member A. S. M. E., superintendent of power stations.

(To be concluded in September)

A Remarkable New Steam Radiator Valve for Two-Pipe Gravity, Open Tank or Vacuum Systems of Heating.

A novel departure in the construction and operation of a steam radiator valve applicable to two-pipe gravity, open tank or vacuum systems of heating is illustrated in the device recently placed upon the market by a new corporation known as the D. G. C. Valve Company, of New York.

The D. G. C Valve Company is capitalized at $300,000 and the following list of officers will indicate the character of the men behind it, as well as the resources of the company: President, John H. Eastwood; vice-president and general manager, Albert A. Cryer; second vice-president, George T. Casebolt; treasurer, George Livingstone; secretary, Andrew G. Paul; engineer, C. D. McArthur.

The D. G. C. valve is the invention of Prof. Charles S. Brown, of the School of Mechanical Engineering, Vanderbilt University, Nashville, Tenn. Prof. Brown has made a thorough test of the valve during two winters past and the results he secured were so remarkable as to justify its immediate manufacture on a large scale.

During the past few months additional tests have been made of the valve with special apparatus in the offices of the company in New York, and while some minor improvements were made

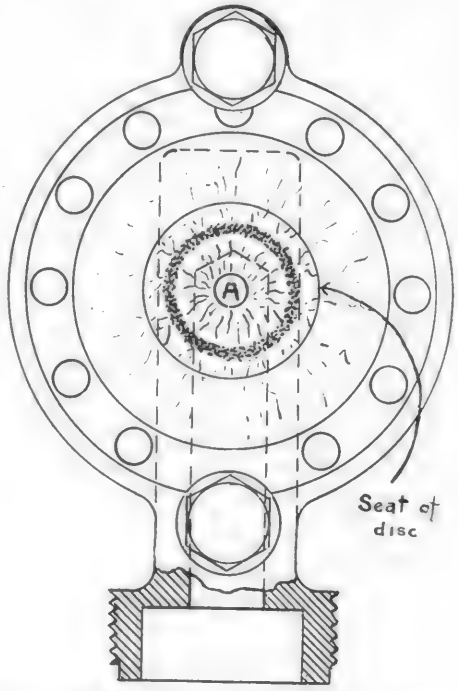


FIG. 1.—PLAN OF SEAT OF D. G. C. VALVE, SHOWING ACTION OF STEAM AS SEEN THROUGH GLASS DISC

in the construction of the valve, the device is essentially the same as that perfected by Prof. Brown.

The letters D. G. C. which form the company's name are descriptive of the action of the valve and stand for "directing," "governing" and "controlling."

The extraordinary simplicity of this new device, when the variety of actions it is capable of performing is taken into consideration, is easily its most striking feature.

The action of the valve is governed by the densities of the gases which pass through it.

Water, being a liquid which does not expand when liberated from under pressure, passes freely out through the

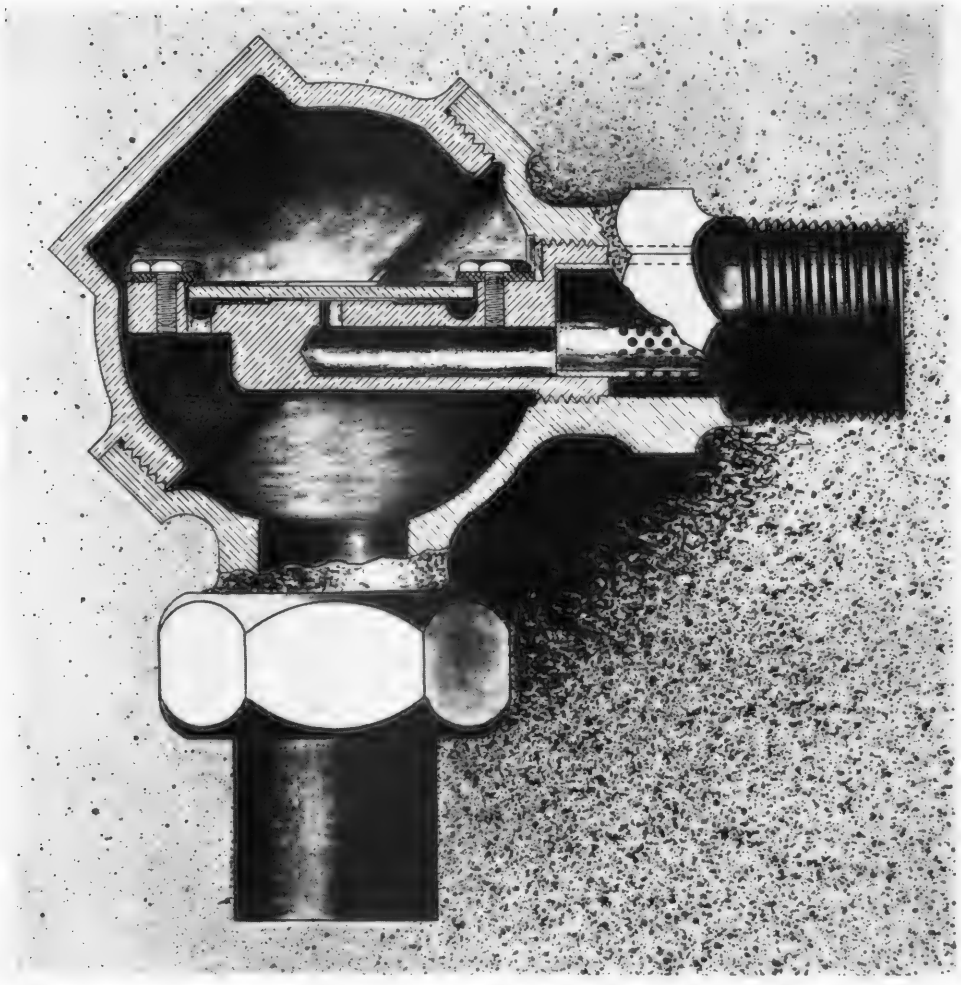


FIG. 2.—BROKEN SECTIONAL VIEW OF D. G. C. STEAM RADIATOR VALVE
Illustration is Actual Size of Valve

valve by raising the disc to its full height.

Air, an expanding gas, flowing up through orifice A (Fig. 1) raises the disc to an initial height of possibly a thousandth of an inch and in spreading out over the seat, expands to a point where its pressure is equal to the pressure on and under the remaining area of the disc. When this point is reached, the pressures under and on the disc have become neutral, therefore the disc will not raise above the initial height. The area from the center to this point, or, more correctly speaking, the area of the circle formed by these points, is known as the area of expansion. The circle itself is called the neutral zone.

When the air has expanded to the neutral zone, it comes in contact with the air surrounding the disc, and is free to mix with it as they are now like gases of the same densities. The rate of mixing, or, in other words, the velocity of flow of the air from the valve, depends upon the pressure under which the valve is operating

Steam, with the power of expansion equal to air under like pressures, influences the disc in the same manner as air, but in spreading out over the area of expansion to the neutral zone, meets the surrounding air at this point and a wall of condensation is immediately formed which checks the flow of steam beyond the neutral zone.

This wall of condensation is constantly being broken down by the globules re-evaporating as they work their way out to the outer surface. New globules are then being formed on the inside of the wall which keeps it at a constant thickness. This process of tearing and rebuilding the wall of condensation is comparatively slow on account of capil-

larity. It, of course, depends upon the pressure under which the valve is operating.

If the disc is placed in the influence of dry steam, steam, *per se*, will not pass through the valve until it has passed through the three stages mentioned above, i. e., expansion until it reaches the neutral zone; condensation at the wall of condensation and re-evaporation when liberated, due to the latent heat of the globules.

This action of steam is plainly seen by replacing the regular brass disc with a glass one. It can also be seen that globules of water are formed on the inner edge of the orifice, which gradually work their way out under the disc and, in so doing, the disc is slightly raised beyond the influence of the steam. This will cause a slight puff of steam to escape.

Drops of water which have been released will be formed on top of the disc and will gradually work their way in towards the center of the disc. As the center of the disc is of a higher temperature than this water, the water rapidly boils, thus giving off a great amount of steam.

A special testing case has been constructed wherein the water leaving the valve is separated from the escaping steam mentioned in the three conditions as coming from the valve; i. e., re-evaporation under the disc; the steam that escapes when a globule of water works its way out from under the disc and the generation of steam on the disc. This steam is taken from the testing case, together with the steam that naturally passes from the valve when it is discharging water, and after passing it through a surface condenser, it is found to be about ¾ lb. an hour per radiator. This small quantity of steam will be condensed in ten feet of pipe after it has left the valve.

The valve is applicable to any two-pipe gravity, open tank or vacuum system of heating.

By the positive control of the air leaving the radiator, it is impossible to short circuit the radiator. No air valve is necessary with any system of heating. The air is removed from the radiator in such a manner at all times that, by the scouring process, the thin film of air which lays on the inner surface of the walls of the radiator is removed, thus allowing the steam to come in contact with the metal itself. This, by repeated tests, has proven to increase the efficiency of the radiator 20 per cent.

We believe there is no form of valve with a wider range of possibilities than this disc form. It is being developed in various styles for radiator control, air relief, cylinder relief and traps.

The Weather for July.

July, in most parts of the country, was a more than usually warm month. The mean temperature of this month in the Eastern cities ran from 2 to 4° above the average for 38 years. In one city, however, St. Louis, the thermometer registered 1° below normal for the mean average.

New York.

The highest temperature recorded was 93°, on the 12th; lowest, 62°, on the 16th; greatest daily range, 23°, on the 12th; least daily range, 6°, on the 21st. Mean temperature for the month, 77°, 3° above the average for 38 years. Total rainfall, 4.33 in., very near the average. Total wind movement, 6,528, mostly from the south.

Boston.

Warmest day, 12th, with 97°; coolest day, 16th, with 58°; greatest daily range, 26°, on the 11th; least daily range, 4°, on the 25th; mean temperature for the month, 74°, 2° above normal for 38 years. Total rainfall, 3.17 in., a trifle less than usual. Total wind movement, 6,987 miles, mostly from the south.

Chicago.

Highest temperature, 96°, on the 1th; lowest temperature, 60°, on the 8th; greatest daily range, 23°, on the 5th; least daily range, 3°, on the 3rd. Mean temperature for the month, 74°, 2° above the mean average for 38 years. Total rainfall, 1.45 in., over 2 in. less than the average for 38 years. Wind movement, 8,552 miles, mostly from southwest.

Pittsburg.

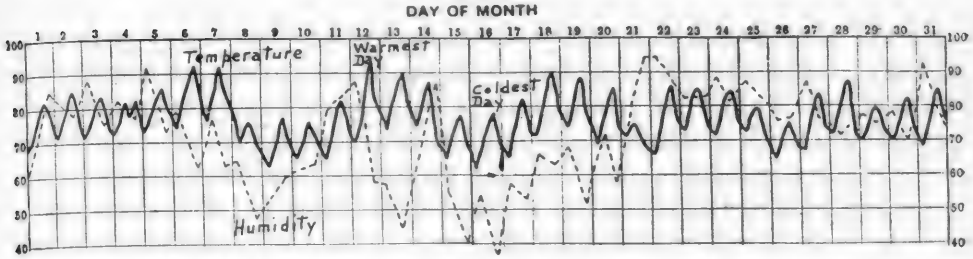
Highest temperature, 92°, on the 6th; lowest temperature, 54°, on the 16th; greatest daily range, 27°, on the 11th; least daily range, 13°, on the 18th. Mean temperature for the month, 75°, corresponding to the mean of this month for 38 years. Total rainfall, 5.07 in., ½-in. more than usual. Total wind movement, 5,408 miles, mostly from southwest.

St. Louis.

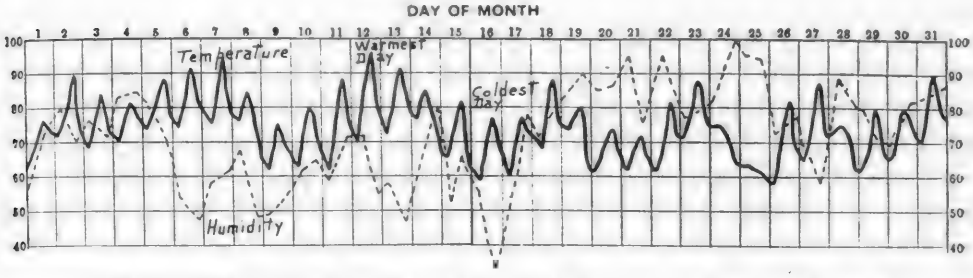
Highest temperature, 92°, on the 11th; lowest temperature, 61°, on the 8th; greatest daily range, 20°, on the 21st; least daily range, 9°, on the 7th. Mean temperature for the month, 78°, 1° lower than the mean of this month for 36 years. Total rainfall, 4.24 in., ¾-in. more than usual. Total wind movement, 5,519 miles, mostly from the southeast.

Trade Literature.

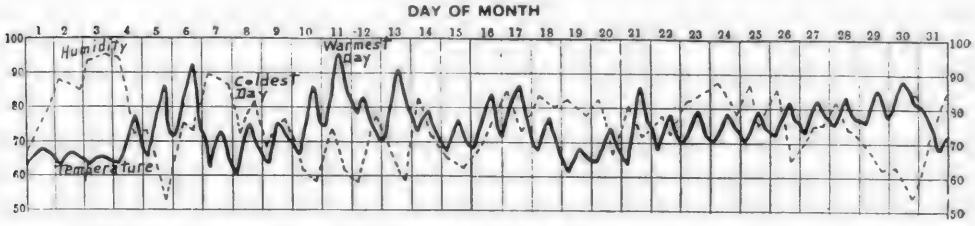
Healthful Air and the Peerless Air Washer are the subjects of an instructive and well-written descriptive catalogue, published by the New York Blower Co., Chicago. The modern re-



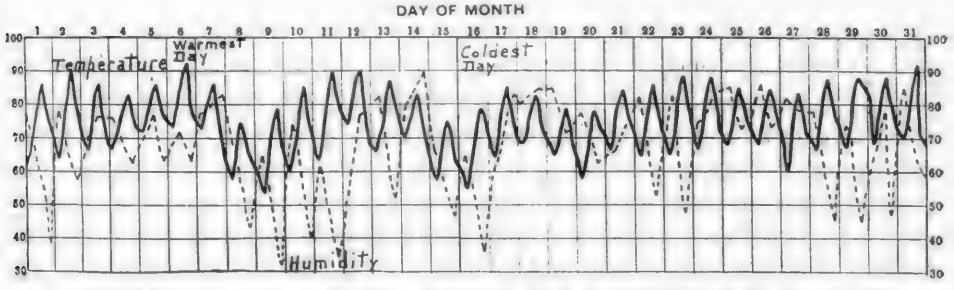
TEMPERATURE AND HUMIDITY RECORD FOR NEW YORK FOR JULY, 1908



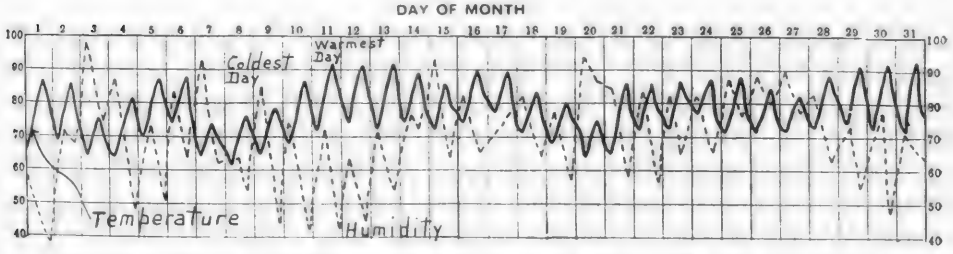
TEMPERATURE AND HUMIDITY RECORD FOR BOSTON FOR JULY, 1908



TEMPERATURE AND HUMIDITY RECORD FOR CHICAGO FOR JULY, 1908



TEMPERATURE AND HUMIDITY RECORD FOR PITTSBURG FOR JULY, 1908



TEMPERATURE AND HUMIDITY RECORD FOR ST. LOUIS FOR JULY, 1908

quirements for dustless air, as well as air properly humidified, are discussed at length in a most interesting manner and the description includes many new ideas on the subject that we have not seen so well expressed heretofore.

"Vapor," says the writer in one place, "does not condense in contact with mere air, but upon very minute solid particles, motes or dust. Thus a cloud takes form. In fact condensation cannot take place except upon those smaller nuclei of dust which are present in the lower atmosphere. So the dust particles are essential to both the collection of minute organisms and of the vapor of water.

"Since a raindrop is an aggregation of cloud particles, it contains a vast number of solid particles or invisible motes. Besides this "dust," it attaches to itself soluble gases contained in the air; the result chiefly of animal life, of decomposition of organic matter and of manufacturing processes. Each drop thus bears with it a miscellaneous collection of matter.

"The action of rain as a universal washer and collector of dust, and the inability of that dust to escape when in a moist condition naturally suggests the principle upon which artificial methods may be employed for removing the objectionable matter from the air provided for respiration.

"But moisture plays an all important part in human comfort. The presence of aqueous vapor is not accidental; it is present in the atmosphere on every portion of the globe. But it varies greatly with every change in temperature. On an average, air contains about 1% of its volume in the form of water vapor. But the total relative weight which can be held in suspension increases rapidly with the temperature. Thus air at zero, with a relative humidity of 100% would if heated to 80° without the addition of moisture have a "relative" humidity of only 4%, that is it would contain only 4% of the amount which would be required to saturate it. Its 'absolute' humidity, or the total amount of contained moisture, would remain constant except as affected by the increased volume of the air. Half a grain of water is all that is required to saturate the air at zero but over twenty times as much is necessary when the temperature is 80°. If the air is taken at a temperature of 20° with 70% humidity and raised to 70° the relative humidity would be about 12%.

The Peerless Air Washer's characteristic features are its spray heads and eliminators. The individual spray head or atomizer is of cast brass particularly designed for efficiency with relatively low water pressures. It is given the form of a branching pipe with the ends bent so as to face each other; one stream of water is thus forced directly against the other. The inner chamber at the end of each branch pipe is machine-finished to a shape determined by experiment which permits of the discharge of water in an expanding stream. The two equal streams thus formed, or shaped, impinge directly upon each other and break into an almost invisible mist or spray. Exact adjustment and equalization of the flow is made by a brass slotted-head screw at the bend of each pipe. By removing the screw ready opportunity is provided for cleaning and the removal of any obstruction.

The spray heads are supplied with water by horizontal pipes which connect on the outside of the chamber with a vertical supply header. All inside pipes are of brass. The header which is of special construction contains a cylindrical brass screen or filter through which all of the water must pass before it enters the heads. Any danger of clogging the heads with large particles is thereby avoided. By a very simple arrangement the filter may be instantly removed for cleaning. There is no opportunity for rusting in any part of the system.

The eliminator, or more properly the eliminators, for they are usually installed in series, are particularly designed for high efficiency in the removal of excess moisture without the creation of undue resistance. Each unit of the complete eliminator consists of a vertical series of upward curved perforated plates, carried between end plates. The entire construction is of copper, and quite indestructible. The arched form of the plates gives great rigidity. Each plate is in effect a perforated screen, the perforations being of slot form with the greatest dimension horizontal. The curvature of the plates is such that air cannot pass directly through the space between them, but is deflected from a straight course.

The catalogue also includes a description, illustrated, with sizes, capacities, prices, etc., of the company's horizontal side suction centrifugal pumps and same pump direct connected to vertical steam engine; also side suction centrifugal pump direct connected to electric motor. Size of catalogue, 6x9 in. (standard). Pp. 32. Illustrated.

Sectional Adjustable Elbows, used as terminals on ventilating ducts to control the direction and volume of the air delivery, are described in a pamphlet issued by the McCreery Engineering Co., Toledo, O. These elbows are constructed so that they may be turned at will in any direction. Both butterfly dampers and sliding gates are used for controlling the air volume. Dimensions are given for brass or nickle-plated adjustable elbows and for galvanized iron adjustable elbows from 3 in. to 12 in. in diameter.

TRADE AND MISCELLANEOUS NOTES

Coming Events.

August 25-28, 1908. Twenty-sixth annual meeting of the American Public Health Association, Winnipeg, Manitoba.

Deaths.

Carl Lunkenheimer, first vice-president of the Lunkenheimer Co., Cincinnati, O., died at Pasadena, Cal., July 19.

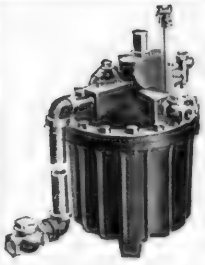
John H. Pierce, former president of the Western Tube Co., Kewanee, Ill., died in Chicago, July 22. He was 65 years old. Mr. Pierce was one of the founders of the Western Tube Co. in 1868, and was its first secretary. He was made president in 1890.

Miscellaneous Notes.

National Association of Brass Manufacturers has issued a circular letter to the manufacturers and jobbers of plumbing and steam supplies in the United States, in which it calls attention to the recent action taken at its meeting in Toronto regarding the changes in list prices in plumbers' brass goods, to the effect that all such changes be made and published not later than July 1, 1909, such changes to go into effect Jan. 1, 1910. The advance notice is given for the benefit of those who contemplate issuing catalogues or other printed matter.

Lincoln, Ill.—An ordinance granting a 30 years' franchise to the Lincoln Railway & Light Co. for a heating plant to be operated through the city streets of Lincoln has been tabled by the city council.

Davenport, Ia.—The ordinance providing for the maintenance of a steam heating plant in Davenport has passed the city council. The passage of the ordinance assures a central station heating plant to the city for the next five years. The meter rates to be charged are 95c. for the first 10,000 lbs. of con-


CLASS A RETURN TRAP

—ESTABLISHED 1870—

The Albany Steam Trap Co.

ALBANY, N. Y.

Manufacturers of

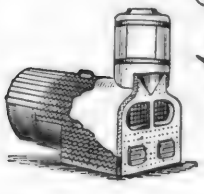
RETURN STEAM TRAPS, NON-RETURN STEAM TRAPS, PUMPS, PUMP GOVERNORS. ALSO HIGH GRADE STEAM VALVES

Our 37 years' experience in this line is worthy of your attention

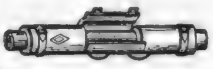
JAMES H. BLESSING, President

THOMAS F. RYAN, Sec. and Treas.

TELEPHONE CALL 6097 FRANKLIN.



ROBERT A. KEASBEY CO.



HEAT AND COLD INSULATING MATERIALS

HEADQUARTERS FOR 85% MAGNESIA, ASBESTOS AND BRINE PIPE COVERINGS, ASBESTOS PRODUCTS, ETC.

ESTIMATES FURNISHED AND CONTRACTS EXECUTED.

100 NORTH MOORE ST, NEW YORK CITY.

densation used per month, and 40c. for all remaining condensation per month. A flat rate per cubic foot will be charged as follows: Front or rear rooms only on upper floor, $5.00; any set of rooms with side, front and back exposure, $4.00; any set of rooms with front and back exposure only, $3.75; any building, with side, front and back exposure, having over 150,000 cu. ft. of space, $3.50; any building with front and back exposure only, having 150,000 cu. ft. of space, $3.00. The new company will have the plant in operation October 1.

Building operations for June, as compared with those of June, 1907, show a decrease in the Eastern cities of 11%; Middle West, 13%; Pacific Coast, 33%; Southern cities, 18%. Some of the larger individual cities, including Manhattan and the Bronx, show an increase.

Manufacturers' Notes

Bristol Co., Waterbury, Conn., manufacturer of pressure recording gauges and similar instruments, has taken over the business of William H. Bristol, who, since his withdrawal from the Bristol Co., in 1904, has operated a plant in Jersey City for the manufacture of pyrometers, smoke chart recorders, electric thermometers, etc. The plant at Jersey City has been moved to Waterbury.

American Radiator Co., Chicago, Ill., announces that it has purchased the plant, patents and patterns of the A. A. Griffing Iron Co., Jersey City, bankrupt. The plant in Jersey City will be used as a distributing center and the goods formerly made by the A. A. Griffing Iron Co. will be manufactured in one of the American Radiator Co.'s plants.

American District Steam Co., Lockport, N. Y., suffered a loss by fire of $115,000 July 24, when its main building, containing $40,000 worth of special machinery, foundry and boiler rooms, dry kiln and stock room was practically destroyed by the flames. The fire burned 1,000,000 ft. of lumber stored in the yards of the company. The loss is covered by insurance. The company will rebuild immediately.

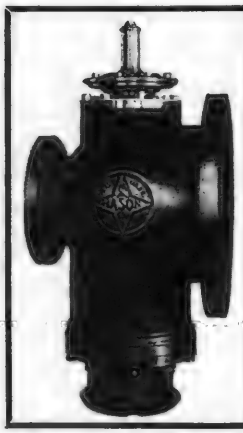
A. M. Byers & Co., Pittsburg, Pa., are building a new pipe mill on the South Side, Pittsburg. The new mill will manufacture principally lap-weld wrought-iron pipe, the company having relinquished its lease on the plant of the Clearfield Steel and Iron Co., at Clearfield, Pa. Plans have also been drawn for a new puddling mill at Girard, O., and a large addition to the power plant at that place. The new power equipment will include ten additional 125 H. P. boilers and a 750 H. P. engine.

United States Heater Co., Detroit, Mich., has opened an office and salesroom at 139 Jefferson avenue, Detroit, to be known as the Detroit branch. It will be headquarters for salesmen operating in the middle western states.

Crane Co., Chicago, is building a new warehouse at Salt Lake City. The building will have a floor space of 84 x 100 ft. and will be three stories high. The plans also include a building 25 x 165 ft., to be used as a pipe house.

National Tube Co., Pittsburg, Pa., has received an order caling for 180 miles of pipe, to be used for the new pipe line of the Columbia Oil & Gas Co. running through Ohio. The order amounts to $1,500,000.

Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., suffered a loss by fire of $45,000, July 17. The fire, it is supposed, was caused by a defective wire. It burned one of the company's warehouses containing plumbing goods. Much of the damage, however, was caused by water, which also injured some of the office records and other pa-



MASON
REDUCING VALVES
for
Heating Systems
And for Every Service. Write for Catalogue

The Mason Regulator Co.
Boston, Mass.

pers. The plant at Eastwood will enable the business of the firm to proceed without interruption.

New Incorporations.

Wm. Vail Co., New York. Capital stock, $1,000. Incorporators: William Thompson, M. G. Vail and James W. Murphy.

Oberndorf Mfg. Co., Pittsburg, incorporated to manufacture heating and plumbing specialties. Incorporators: Edward Oberndorf, H. D. Montgomery and E. Sunstein.

McCawley Plumbing Co., Des Moines, Ia. Capital stock, $10,000.

W. L. Hubbard Co., Scottsburg, Ind., capital, $20,000; to engage in hardware and heating and plumbing business.

Dighton Foundry Co., Taunton, Mass. Capital stock, $50,000. Directors: Herbert Q. Presby, Fred P. Leonard and William L. White.

Argand Boiler Co., South Norwalk, Conn., capital, $6,000; to take over the business of the Colonial Foundry & Machine Co., manufacturer of steam and hot water boilers. President, Edward S. Meeker; treasurer, Charles H. Aisthorpe; secretary, William S. Folant.

Crow-Wynn Heating Co., 4070 East 82d street, Cleveland, O. Capital stock, $5,000. Incorporators: Edward Crow, W. P. Wynn, T. F. Anderson, M. A. Crow and D. Wynn.

D. G. C. Valve Co., New York, capital, $300,000; to manufacture the D. G. C. valve for steam radiators. President, John H. Eastwood; vice-president and general manager, Albert A. Cryer; second vice-president, George T. Casebolt; treasurer, George Livingston; secretary, Andrew G. Paul; engineer, C. D. McArthur.

Cass Plumbing Co., Pittsburg, Pa., incorporated to engage in the heating, plumbing and gas fitting business. Incorporators: E. F. Cass, C. E. Cass and John G. Steitz, all of Pittsburg.

Sanitary Plumbing Co., Hattiesburg, Miss. Capital stock, $10,000. Incorporators: W. R. Williams and J. E. Davis.

Crain-Stuart Co., Springfield, O., capital, $20,000; to conduct a heating and plumbing business. The company has purchased the heating and plumbing business of the R. P. Willis Co., of Springfield. The business will be continued at 20 South Limestone Street. The officers of the new company are: President, C. R. Crain; vice-president, G. L. Bauer; treasurer, W. A. Bauer; superintendent, Charles C. Stuart.

Williams Foundry & Machine Co., Akron, O. Capital stock, $75,000. J. K. Williams is the principal of the company.

Iowa Fitting Co., Marshalltown, Ia., capital, $10,000; to operate a machine shop and to conduct a heating, plumbing and gas fitting business. President, E. T. Baker; secretary, A. L. Frazer; treasurer, A. L. Clark.

Des Moines Heating Co., capital, $1,065,000; to purchase, build, maintain and operate steam, hot water and heating plants and to generate power. Incorporated in Delaware.

Sidman Co., Rochester, N. Y., capital, $10,000; to manufacture heating and ventilating and moistening apparatus. Incorporators: T. Fred Barrows, Edward D. Sidman and Anna B. Sidman, all of Rochester.

Spencer Heater Co., Scranton, Pa., manufacturers of steam and hot water boilers and radiators, has been capitalized at $200,000 and are authorized to operate in Illinois with a capital of $11,000.

A. B. Wheeler & Son, Wausau, Wis., capital, $25,000; to engage in the heating and plumbing business.

Business Chances.

Newkirk, Okla.—The Board of Trustees of the State Insane Asylum are making arrangements for the installation of an ice plant and a heating plant at the insane asylum at Fort Supply.

ENGINEERS AND STEAMFITTERS REQUIRE GOOD TOOLS

The GENUINE ARMSTRONG Stocks and Dies are

RELIABLE, ACCURATE, EASY WORKING

MANUFACTURED BY

THE ARMSTRONG MFG. CO., 321 Knowlton St., BRIDGEPORT, CONN.

Chicago.—Acting upon orders of the Chicago school board, $750,000 is being spent this summer on repairs on the Chicago public school buildings. Of this amount, $250,000 will be spent on new heating and plumbing apparatus, including new boilers. The work is giving employment to 8,000 men.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until August 31, 1908, for the construction of an extension (including plumbing, heating apparatus, electric wiring and conduits) of the U. S. Post-office and Court House at Little Rock, Ark.

Until September 1, 1908, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post-office at Greenville, O.

Until September 9, 1908, for the construction complete of the U. S. Post-office and Court House at Sheridan, Wyo.

Until September 10, 1908, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post-office at Kenosha, Wis.

Until September 16, 1908, for the construction complete of the extension to the U. S. Post-office at Youngstown, O.

Calumet, Mich.—In connection with the proposed new depot of the South Shore and Mineral Range roads in Red Jacket it has been decided to have a commodious basement so that a new heating plant may be installed. This plant will be used not only to heat the new depot, but the sleepers and other cars as well.

Business Change.

Economy Steam Heating & Electric Co., Sedalia, Mo., has increased its capital stock from $50,000 to $125,000.

Contracts Awarded.

J. C. Bixby & Son, Omaha, Neb., heating 17th Ward school in Council Bluffs, Iowa.

Spriggs Bros., Grand Forks, N. D., heating North Dakota Improvement Co's building in that place.

Kelley & Bell Co., Aberdeen, S. D., heating new school in Ipswich, S. D.

Dewstoe-Brainerd Co., Cleveland, O., heating Cleveland post-office building.

Lewis & Kitchen, Kansas City, Mo., heating Lincoln school at Fort Dodge, Iowa.

Hammer Bros., Great Barrington, Mass., indirect steam heating new school building at Housatonic. Bid, $6,315.

J. L. Judge, Minneapolis, Minn., heating St. Boniface's Church and school at Hastings.

El Paso Heating & Plumbing Co., El Paso, Texas, heating and plumbing addition to court house.

M. B. Sanders, Little Rock, Ark., heating and plumbing Mitchell and Parham schools at that place.

Blackstone Heating Co., Pawtucket, R. I., heating Grove street school for $1,000.

Nichols & Drown Co., Lynn, Mass., heating and ventilating Chestnut street school, to replace present apparatus, for $1,523.

M. J. Daly & Sons, Waterbury, Conn., vacuum steam heating and ventilating new Westover school for girls at Middlebury, Conn.; also steam heating and plumbing new St. Mary's hospital at Waterbury.

J. A Ahler Plumbing Co., Knoxville, Tenn., vacuum steam heating for two school buildings at Morristown, Tenn.

Brookfield Heating & Plumbing Co., Brookfield, Mo., heating school at Marceline.

Jennison Co., Fitchburg, Mass., heating, ventilating and plumbing new high school building at that place.

G. A. Stees, St. Paul, Minn., heating new Federal building at Los Angeles, for $31,925. Thomas Harity, Los Angeles, has the plumbing contract, at $42,170.

John A. Scollay, Brooklyn, N. Y., hot water heating and ventilating system for Plymouth Church, Brooklyn. The plant will be installed according to plans and specifications prepared by William M. Mackay, of New York.

Jonas A. Mills, Cleveland, O., steam heating Canton high school at Canton, Ohio.

Birdy & Sheehan, Bristol, Conn., steam heating and plumbing Southern New England Telephone Co.'s building.

Ferris Bros., Manchester Conn., heating and plumbing new Salvation Army building at South Manchester.

James F. Dunn, Stamford, Conn., steam heating and plumbing new Roman Catholic Church at that place.

Theodore Sheide, Lima, O., steam heating new $25,000 Thompson building at Lima.

Taylor & Taylor, Meriden, Conn., heating and plumbing new armory building.

Arthur H. Moulton, Portland, Me., steam heating new St. Joseph's convent and home at Deering.

American Heating & Ventilating Co., Toledo, O., heating and ventilating North Side school building at Defiance,

O., for $1,951; also heating schools at Lima and Monterey.

Fuller & Warren Co., Boston, Mass., heating and ventilating Maynard and Harvey schools at Westboro.

Bradley Heating Co., St. Louis, Mo., contract for remodeling heating and ventilating systems of McKinley and Yeatman high schools, for $11,500.

Aetna Heating Co., Leominster, Mass., steam heating parochial school at that place; Cleghorn Plumbing Co., Fitchburg, Mass., ventilating same building.

Globe Engineering Co., San Francisco, Cal., ventilating and pumping systems for the Claus Spreckels building annex.

Bartlett Bros. Co., Youngstown, O., heating new North Side public school, for $4,059.72. Jacob Brenner, also of Youngstown, has the plumbing contract.

Morgan & Co., Santa Cruz, Cal., heating Bay View school, for $3,100; Grant school, for $400, and high school, for $1,650.

Bartley-Kennedy Co., Pittsburg, Pa., heating new $50,000 public school building at Edgewood, Pa.

McGinness-Smith Co., Pittsburg, Pa., steam heating $100,000 warehouse in that city, for Boggs & Buhl.

Kraus-Kirn Co., heating and plumbing new central police station in that city. Bid, $3,944.

Columbus Heating & Ventilating Co., Columbus, O., heating new Portage Path school at Akron.

Huffman-Conklin Co., Columbus, O., heating and plumbing new chemical laboratory for Buchtel College, Akron.

Peck, Anderson & Peck, Cincinnati, O., heating new high school building at Bluefield W. Va., for $15,000.

Chas. R. Wells, Battle Creek, Mich., heating and plumbing Central State Normal School, at Mt. Pleasant.

Tunstead Heating Co., Minneapolis, Minn., heating Bryn Mawr school in that city, for $3,695.

Anderson-Darragh Co., Pittsburg, Pa., steam heating two new buildings for Carnegie Technical Schools in Schenley Park, Pittsburg.

Jones & Burk, Franklin, Ind., heating and plumbing new $30,000 school building at Kirklin, Ind., also central station heating plant for the Second Ward school at Frankfort.

H. Kelly & Co., Minneapolis, Minn., heating plants for Hamilton, Kenwood, Grant, Longfellow, Marcy, Harriett and Pillsbury school buildings, in that city. The combined contracts amount to $45,550.

Clifton Plumbing & Heating Co., Owatonna, Minn., heating and plumbing addition to high school.

Lynch & Woodward, Boston, Mass., heating new city hospital at Providence, R. I., for $36,456. Tierney-Colgan Co., Providence, has the plumbing contract, at $20,198.

Allen, Meyers & Co., Clinton, Iowa, heating and ventilating system for Longfellow school in Rock Island.

Huffman-Conklin Co., Columbus, O., heating and plumbing Southern Hospital for the Insane at Madison, Ind. The contracts amounts to $176,000.

Emporia Plumbing Co., Emporia, Kan., steam heating Bickerdyke Home at Ellsworth, Kan.

J. C. Distler, Mishawaka, Ind., heating and plumbing hotel in South Bend, Ind.

Gouverneur Plumbing Co., Gouverneur, N. Y., heating, ventilating and plumbing new school building at Clayton, for $5,025.44.

F. A. Clegg & Co., Louisville, Ky., remodeling steam heating plant in insane asylum at Jackson, Miss., for $11,545.

Elliott & Berry, El Paso, Tex., heating four schools in El Paso, for $4,368.

Justus Plumbing Co., Masillon, O., heating and plumbing new school building at Sebring. Bid, $2,808.

ESTABLISHED 1875 Telephone, 211 Cortlandt

THOMAS H. PREST

NEW YORK, NEW JERSEY AND EASTERN PENNSYLVANIA

Sales Agent for Garden City Fan Company's Goods

FANS, BLOWERS AND EXHAUSTERS, HEATING VENTILATING AND DRYING APPARATUS

SINGER BUILDING 149 BROADWAY NEW YORK

Pueblo Plumbing Co., Pueblo, Colo., steam heating addition to St. Mary's hospital; also heating and plumbing Anheuser-Busch building.

DeBurke Plumbing Co., Pueblo, Colo., heating and plumbing German-American Club building and Pope building at that place.

M. J. O'Neill, St. Paul, Minn., heating, plumbing and wiring new post exhange and gymnasium building at Boise Barracks, Idaho. Bid, $4,492.

M. J. Carnahan Co., Washington, Ind., heating new ward school building at Linton, for $1,419.

Bryce Heating & Ventilating Co., Toledo, O., heating Hoagland school at Fort Wayne, Ind., for $4,013.50; also power plant for same building, to cost $2,250.37.

Brown Bros. Co., Saginaw, Mich., heating Jerome school, for $1,265.

H. G. Newman Plumbing Co., Evansville, Ind., remodeling steam heating plant in the Hennessy-Robinson building.

Peck-Hammond Co., Cincinnati, O., heating new school building at Larwill, for $1,750.

Illinois Heating & Plumbing Co., Paxton, Ill., steam heating North Side school at Watseka.

Hubbard & French, Boston, Mass., heating and lighting plant for County Court House at Cleveland, O.

Louis N. Davis, West Chester, Pa., steam heating new Y. M. C. A. building for $1,480.49. Steam will be supplied to the building from mains in the street.

Fargo Plumbing & Heating Co., Fargo, N. D., heating, plumbing and electric wiring of the Gardner Hotel at Fargo.

Libby & Blinn, Hartford, Conn., remodeling heating system of the Hartford Hospital. An indirect system will be installed.

Waterburg Co., Minneapolis, Minn., heating and ventilating District No. 3 schoolhouse.

Central Station Engineering Co., Lebanon, Ind., contract for extending the heating system of the Canton (Ill.) Gas and Electric Company.

Edward Fay & Sons, Philadelphia, contract for buildings, steam heat and air systems, water supply and drainage for the Reading's Huntington Street Passenger Car Cleaning Yard. The yard will have a capacity of 220 passenger coaches.

Joseph Snyder, Springfield, Mo., steam heating Phelps school at that place.

John F. Cunningham, Springfield, Mo., heating Rogers school building at that place.

Custer & Richards, Bridgeton, N. J., heating plant for new public school building at Pleasantville.

American Heating Co., Rockford, Ill., steam blast heating and ventilating system in the Hackett and Royce schools, at Beloit, for $8,500.

McMillan & Wagner, Moorhead, N. D., heating Clay County Court House building, for $2,284.

J. F. Schwegman, Fort Wayne, Ind., heating and plumbing Lyric Theatre.

Wheeler-Blanay Co., Kalamazoo, Mich., heating Woodward avenue school at that place.

O. C. Davis Co., Racine, Wis., heating and plumbing addition to the Lincoln school at that place. Heating contract, $4,800; plumbing contract, $2,369.

J. J. Howden Plumbing & Heating Co., Muskegon, Mich., heating and ventilating high school annex at that place. The work wil cost about $8,500.

C. G. Smith, Dixon, Ill., hot water heating McBride block at that place.

Schellhammer & Son, Warren, Pa., steam heating and plumbing addition to the Warren Emergency Hospital in Warren.

Bartlett Bros., Youngstown, O., heating $50,000 school building at that place.

C. F. Henry, Youngstown, O., hot water heating and plumbing new apartment and business block for H. F. Duesing in Youngstown.

Barr & Creelman, Rochester, N. Y., heating, ventilating and plumbing new public school buildings in that city. The combined contracts amount to $30,000.

Barnd & Geiger, Buffalo, N. Y., steam heating Public School No. 55, in Buffalo, for $6,000; steam heating new convent for $22,000; also heating large new armory at Mohawk, N. Y.

Keefe Bros., Oswego, N. Y., installing two cast-iron boilers in city almshouse.

"THE POTTER" MESH SEPARATOR
OR BOILER DRY-PIPE
DRY STEAM—SAFETY—ECONOMY
POTTER SEPARATOR CO., Newburgh, N.Y. **N.Y. OFFICE: 39 Cortlandt St.**

Brown Bros. Co., Saginaw, Mich., heating Jerome school, for $1,265.

P. J. Gallagher, Faribault, Minn., new heating and ventilating system for Faribault High School. Bid, $6,600.

Martin & Wigman, Green Bay, Wis., heating Franklin school at Escanaba, Mich.

E. G. Coates, Findlay, O., heating DuMont Hotel in Ottawa.

Hurley & Co., St. Paul, Minn., heating plant for Hospital for the Insane at Superior, Wis. Bid, $14,000. The America Heating Co., Superior, was awarded the contract for a vacuum system for this building, to cost $1,400. Another portion of the heating contract went to Neil & Co., Superior, at their bid of $1,950.

W. F. Sheehan, Topeka, Kan., heating and plumbing new Roman Catholic Church on West Sixth street. Bid, $15,000.

Bernard Gause, Jacksonville, Ill., heating new school building at Pittsfield, Ill., for $2,470.

McGuire Bros., Rockford, Ill., heating Hackett and Royce schools at Beloit, for $7,615.

Moline Heating & Construction Co., Moline, Ill., heating and sprinkler systems for Deere branch house at Omaha, Neb. Bid, $25,000.

Zook & Bentz, Waterloo, Ia., heating, ventilating, plumbing, electric wiring, gas fitting, sheet metal work and fire escapes for new Waterloo High School and Manual Training building at that place. The contract amounts to $23,000.

Thomas E. Gildea, Syracuse, N. Y., heating and ventilating old Court House and county buildings in that city. Bid, $10,493.

NEW DEVICES

Ideal Sylphon Regitherm

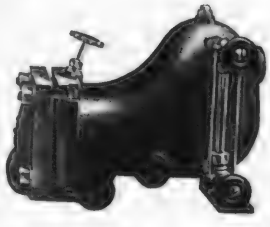
Ideal Sylphon Regitherm is a new temperature regulating device that has been placed on the market by the American Radiator Co., Chicago, and is illustrated and described in a recently-issued circular. It is a compact fixture automatically controlling the temperature at any point between 60° and 80° and may be used for steam and hot water heaters, hot air furnaces or gas supply.

The construction and operation is based on the same principles as govern a thermometer, i. e., the action of heat or cold on a volatile chemical. In the regitherm is a metal bellows capable of expanding and contracting like a telescope. Within this bellows is sealed,

REGITHERM SHOWING THERMOMETER

McDaniel Improved Steam Trap

WILL DO THE WORK



When you need a Steam Trap buy one you know will work. With a McDANIEL we take all the chances. Don't pay until you are satisfied. We have been 25 years manufacturing Steam Traps and know there is no better trap made. May we send you one for trial?

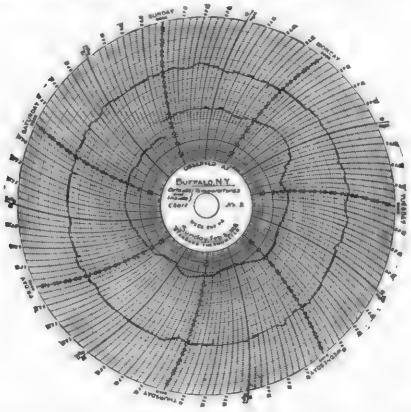
Watson & McDaniel Co.

160 North 7th Street - PHILADELPHIA, PA.

Send for Catalogue

air-tight, a small amount of the volatile liquid. The slightest variation of temperature changes the form of the liquid (expanding by vaporizing, contracting by condensation), hence changes the outward pressure exerted by it. This pressure moves the bellows, so that a change of 1° in the room temperature will change its pressure at the rate of about ½ lb. per square inch.

The area of the end wall or "head" of the bellows is 30 sq. in., so a change of 1° in temperature (developing, as shown above, ½ lb. per square inch) creates a force of 15 lbs. within the regitherm. This force is sufficient to expand the bellows ½ in. The motive force



RECORD CHART SHOWING STEADY TEMPERATURE

thus created operates a short lever arm at the back of the regitherm, causing it to rise with rising temperature and fall with falling temperature. A small wire cable leads from this lever arm to a balanced lever in the basement which controls the dampers of the heater. By this transmission the movement of ½ in. at the regitherm is magnified eight-fold by being transmitted to the dampers, giving a wide range of action upon the heater. Means are provided within the regitherm to neutralize the resilience, or "spring," in the bellows, so there is no increased resistance offered by the bellows during the expansion or contraction. The wire cable has a breaking strength of 260 lbs. and the force exerted by the regitherm is so positive and powerful as to neutralize friction losses

The shipping weight, including all necessary parts, is 50 lbs. The list price is $35.00 each.

The chart shown herewith is the record of a test made by the company's department of research and covers a period of seven consecutive days. Beginning Sunday at 9 A. M. the inner line (recording the outside temperature) shows the thermometer to register 28° above zero. The regitherm (shown by the outside line) registers 72°. On Monday the outside temperature raises to 36°; on Tuesday drops to 11°; Wednesday to 2° below zero, rising gradually to 10° above zero on Saturday.

Improved Modern Boiler.

The Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., is calling the attention of heating engineers and the trade generally to its latest type of steam and hot water boiler, known as the Improved Modern Boiler. In outward appearance the Improved Modern is the same as the Touraine, Jr., one of the most popular boilers made by the company, but the inside construction of the new boiler marks a step further in advance. The fire-pot has been made rounded so that it covers the entire fire chamber with water surface. The water ring or section has been improved, so that the front of the section extends outwards to a point where it is on a line with the firepot and dome, and it has two flue holes in the front of the section to allow the gases to pass through. This rounded firepot and improved section gives the boiler a very effective fire travel, thus adding to its efficiency in the use of fuel. The boiler is unusually simple in construction and easy to erect, which are considered particularly advantageous features.

MORE HEAT FROM LESS COAL

Repeated tests by prominent engineers have invariably shown that when steam pipes insulated with ordinary coverings were recovered with ASBESTO-SPONGE FELTED COVERINGS, condensation and heat radiation were so reduced that the same amount of heat could be delivered at the end of line with 75 per cent. of the coal formerly used. We can show you proof of this.

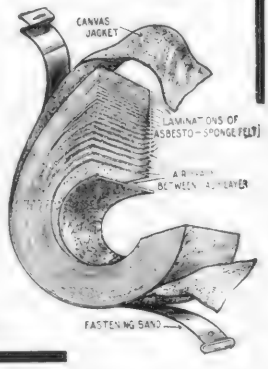
ASBESTO-SPONGE FELTED

is not only the most efficient pipe covering but the most durable. No matter how roughly it is handled or how severe the service, it will not crack, crumble, decay or lose its insulating value like moulded coverings.

Write nearest branch for Sample and Booklet

H. W. JOHNS-MANVILLE CO.

New York
Milwaukee
Chicago
Boston
Philadelphia
St. Louis
Pittsburg
Cleveland
Buffalo
Detroit
Baltimore
New Orleans
Kansas City
Minneapolis
San Francisco
Los Angeles
Seattle
Dallas
Toronto
London (855)



The Standard Steam Specialty Company

UTILITY Exhaust Muffler, Oil Separator, Return Tank Pump Governor and Feed Water Heater

UTILITY Vertical Steam Receiver and Separator

UTILITY Pump Governor Valve and Head

UTILITY Pump Governor Valve

UTILITY Steam Separator

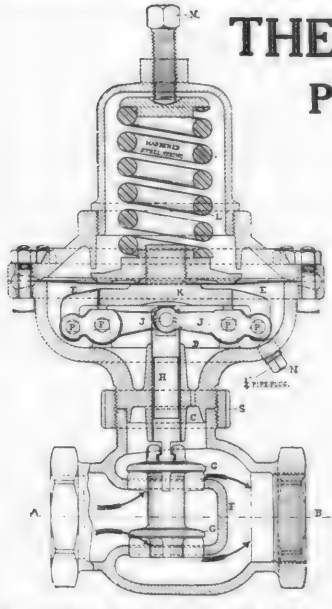
UTILITY Pump Governor

UTILITY Exhaust Head

Specify **Utility** Specialties in your work and we will guarantee their value in use.

Send for Catalogue H

542-544 WEST BROADWAY, NEW YORK



THE "CASH STANDARD"

Pressure Reducing and Regulating Valves

For Steam, Gas, Air, Water, all Kinds of Service

Close Regulation, Simple, Practical, Durable

Does not Require an Expert to Adjust or Care for it

PHOSPHOR BRONZE DIAPHRAGMS, FOR BOTH HEATING AND POWER PURPOSES

A. W. CASH

313 MARKET ST. : : : NEWARK, N. J.

RECENTLY PUBLISHED

THE

Ventilation Laws

OF THE STATES OF

MASSACHUSETTS NEW JERSEY

NEW YORK PENNSYLVANIA

Comprising all the statutes now in force in this country regulating the ventilation of school and other public buildings

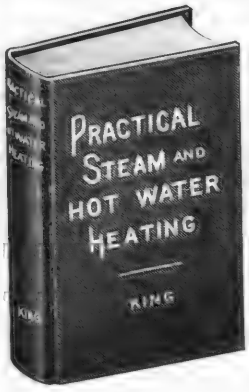
BOUND IN VEST POCKET SIZE

Price, 10 Cents net, or 12 Cents, Postpaid

ADDRESS THE PUBLISHERS

Heating and Ventilating Magazine Co , 1123 Broadway, New York

JUST PUBLISHED



PRACTICAL STEAM AND HOT WATER HEATING AND VENTILATION

By ALFRED G. KING

Author of "Steam and Hot Water Heating Charts," Etc., Etc.

367 pages. Over 300 detailed illustrations, the larger part of them being made from original diagrams, specially drawn for this book.

Price, $3.00

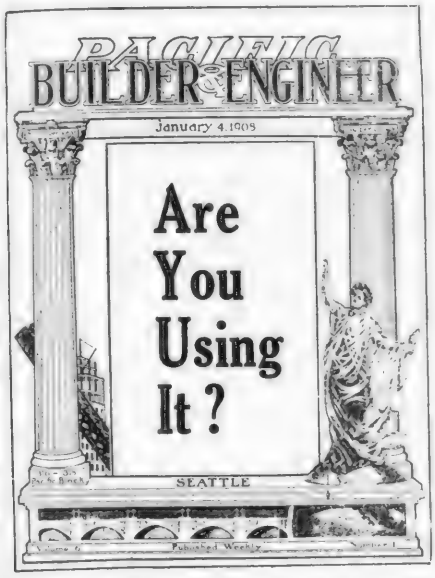
An Elaborate and Complete Work for the Use of Heating Contractors, Journeymen Steam Fitters, Steam Fitters' Apprentices, Architects and Builders.

Valuable Data and Tables Used for Estimating, Installing and Testing of Steam and Hot Water and Ventilating Apparatus are Given.

Copies of this book sent prepaid to any part of the world on receipt of price. Remit by Draft, Postal Money Order or Registered Mail.

The Heating and Ventilating Magazine

1123 Broadway, New York

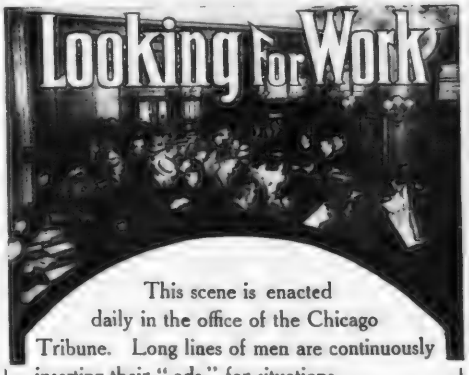


If not, you are losing the best chance of your life of getting before the buyers of a section where business is rapidly reviving, buildings and new plants are being put up, and old equipments being overhauled and renewed. ¶ 44 pages every week of fresh Advance Information. $5.00 per year.

Send for Sample Copy—FREE.

316-A PACIFIC BLOCK, SEATTLE, U. S. A.

The Water Way
DAILY SERVICE
BETWEEN
DETROIT AND BUFFALO
The D. & B. Line steamers leave Detroit week days at 5:00 p. m., Sundays at 4:00 p. m. (central time) and from Buffalo daily at 5:30 p. m. (eastern time) reaching their destination the next morning. Direct connections with early morning trains. Superior service and lowest rates between eastern and western states.
RAIL TICKETS AVAILABLE ON STEAMERS
All classes of tickets sold reading via Michigan Central, Wabash and Grand Trunk railways between Detroit and Buffalo in either direction will be accepted for transportation on D. & B. Line Steamers.
Send two cent stamp for illustrated pamphlet and map of Great Lakes. Address, L. G. Lewis, G.P.A., Detroit
Detroit & Buffalo Steamboat Co.
PHILIP H. MCMILLAN, VICE-PRES. A. A. SHANTZ, GEN. MGR



This scene is enacted daily in the office of the Chicago Tribune. Long lines of men are continuously inserting their "ads" for situations.

How easily any one in this crowd could put himself forever above such a quest for insignificant, poorly paid positions!

It is only positions that require special training, special skill, special knowledge that must and do seek the man. Hundreds of such positions are advertised day after day and still cannot be satisfactorily filled.

The American School of Correspondence, Chicago, is constantly fitting thousands of young men to start life in positions where there is an assured future for a man of ambition and brains. It is taking older men from poorly paid, uncongenial work and placing them where they can secure better pay, better future, better hours and better work for the rest of their working days.

WITHOUT COST TO YOU

We will send you, without extra charge, a set of the Reference Library of "Modern Engineering Practice," in 12 volumes, Half Morocco, 6,000 pages, page size 7 x 10 inches, *provided* you enroll in a full course within 30 days. This is the most comprehensive and authoritative reference work on Engineering and Electricity ever published.

We employ no agents to annoy you with repeated calls at your home or place of business. The money you pay us is not used to maintain an expensive organization of high priced agents, but is used to give you better instruction at a lower cost.

Mark on the coupon the subject that interests you most, sign your name and address plainly, and mail at once.

American School of Correspondence

Div. 160, Chicago

COUPON—Clip and mail to-day

Heat. & Vent. 8—'08.

American School of Correspondence

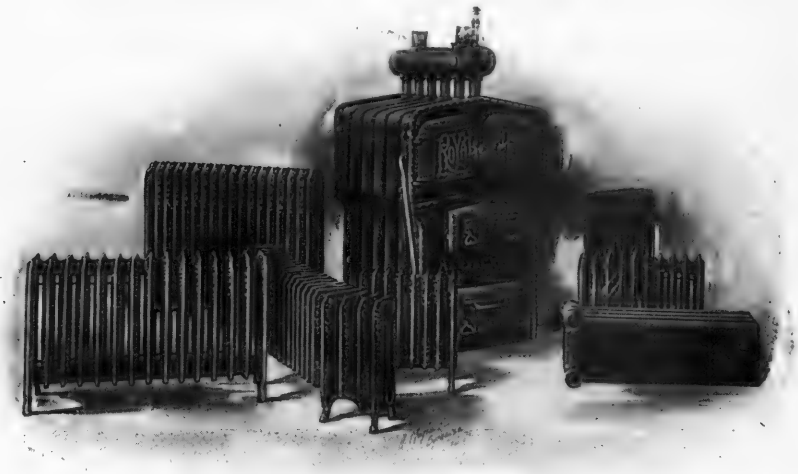
Please send me handsomely illustrated 200-page hand book of engineering information. I am interested in the course marked "X."

....HEATING, VENTILATING & PLUMBING
....STEAM AND HOT WATER FITTING
....GAS FITTING
....BOILERS AND ENGINES
....DYNAMOS AND MOTORS
....ELECTRICAL ENGINEERING
....MATHEMATICS
....MECHANICAL ENGINEERING
....MECHANICAL DRAWING
....STATIONARY ENGINEERING
....ARCHITECTURE
....HYDRAULICS
....COLLEGE PREP. COURSE

Name .....

Address .....

Occupation .....



Let us send you a few copies of "Heating and Ventilating the American Home"—an article in booklet form. You can distribute these to advantage among prospective homebuilders in your town.

HART & CROUSE CO.

Home Office: Utica, N. Y.

BRANCHES:
New York, 41st St. and Park Ave. Chicago, 80 Lake St.
Dallas, 659 Elm St. Columbus, Poplar and Henry Sts.
Minneapolis, Exchange. 742 Lumber

Fitters' Companion

1908

IS NOW READY FOR DISTRIBUTION

WRITE FOR IT

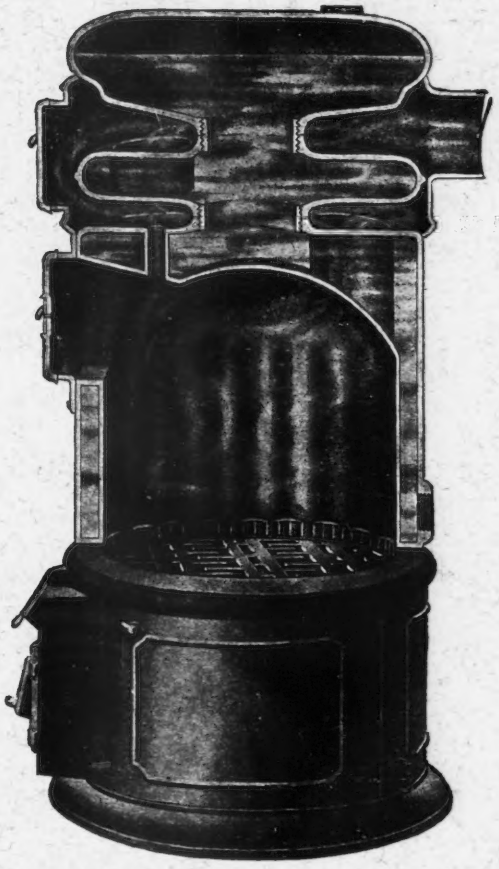
The J. L. Mott Iron Works

118 Fifth Avenue, NEW YORK

THE "MODERN" BOILER

—Improved—

FOR STEAM OR HOT WATER



THE "MODERN" IS AN IMPROVED BOILER ADDED TO THE "PIERCE" LINE

The improved rounded firepot, completely covering the fire chamber, the economical fire travel, the improved water section, the large water ways, the simplicity of construction, the large, roomy base with rocking and dumping grate makes the "Modern" the most desirable boiler for residence heating.

Blue Book Describing This New Boiler Will Be Sent on Request

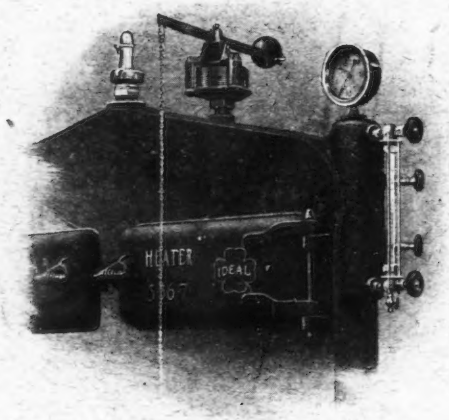
Pierce, Butler & Pierce Mfg. Co.

SYRACUSE - - DEPT. R - - NEW YORK

A Three-Fold Economy

The latest step in advance in manufacturing Steam Boilers is the new Consolidated Water Column—that is, a water column cast on the first section of Ideal Sectional Steam Boilers.

This "new wrinkle" means a three-fold saving to the Fitter: in time, labor, pipe and fittings.



THE NEW CONSOLIDATED WATER COLUMN IS CAST AS PART OF THE FIRST SECTION

The new Consolidated Water Column does away with the labor of making about nine joints in assembling, and also does away with the pipe, elbows, tees, etc., which the Fitter has to furnish.

Just one more step in making IDEAL BOILERS the most economical and profitable of all steam and hot water goods for the Fitter to handle.

AMERICAN RADIATORS & IDEAL BOILERS

AMERICAN RADIATOR COMPANY

General Offices: 282-284 Michigan Ave., Chicago

NEW YORK	PITTSBURG	INDIANAPOLIS	KANSAS CITY	SEATTLE
BOSTON	CINCINNATI	DETROIT	MINNEAPOLIS	LONDON
PHILADELPHIA	ATLANTA	ST. LOUIS	DENVER	PARIS
CHICAGO	MILWAUKEE	OMAHA	SAN FRANCISCO	BERLIN
	BUFFALO		CLEVELAND	